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ABSTRACTS of RECENT PUBLISHED MATERIAL on Soil and Water Conservation

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Agricultural Research Service

December 1954

FOREWORD

The Soil and Water Conservation Research Branch of the Agricultural Research Service is undertaking the preparation and issuance of "Abstracts of Recent Published Material on Soil and Water Conservation."

Our major objective will be to serve persons responsible for field programs in soil and water conservation.

The material will also help many research workers keep in touch with scientific literature in which they are directly and indirectly interested.

Distribution will be handled by SCS, ARS, and cooperating agencies and institutions for their own personnel.

The Branch now conducts most of the research formerly carried on by SCS as well as the soils research formerly done in the Bureau of Plant Industry, Soils, and Agricultural Engineering. New procedures are being established for regular two-way communication between SCS and ARS--the reporting by SCS of research needs and the reporting by ARS of pertinent research results.

In July 1953 the SCS and BPISAE jointly issued "Abstracts of Recent Published Material on Soil and Water Conservation." Previously, seven issues under the same title came out under the imprint of SCS alone.

Authors of articles and reports in the field of soil and water conservation are urged to supply abstracts, reprints, or copies to J. H. Stallings, Soil and Water Conservation Research Branch, Agricultural Research Service, U. S. Department of Agriculture, Plant Industry Station, Beltsville, Md.

Robt M Salter

Chief, Soil and Water Conservation
Research Branch

ABSTRACTS OF RECENT PUBLISHED MATERIAL ON SOIL AND WATER CONSERVATION

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SOIL SCIENCE (BASIC)

Soil Physics

AN ABSOLUTE METHOD OF DETERMINING THERMAL CONDUCTIVITY AND DIFFUSIVITY OF SOILS

By A. D. Misener. Natl. Res. Council. Highway Res. Bd. Spec. Rpt. 2: 51-57. 1952.

The method described here uses measurements during heating or cooling, which may be taken rapidly and will give both thermal conductivity and diffusivity. The mathematics are rigorous and therefore the effect of assumptions made in the theory can be calculated. With heat sources of appropriate shape and dimensions, the measurements may be made absolute, i.e., they are independent of the particular measuring device and are not affected by the thermal properties of the materials used to construct the source. The limits within which this condition is fulfilled can be calculated accurately. The method is applicable to variety of different forms of apparatus. When a suitable form has been selected and a particular apparatus built, the necessary calculations may be made once and presented as graphs from which the desired results are read off as rapidly as readings are taken. A general description of the method will be followed by two particular applications, a spherical heater buried in the material and a linear heater or probe inserted into the material.

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MICA LEPTYLS AND WAVELLITE CONTENT OF CLAY FRACTION FROM GAINESVILLE LOAMY FINE SAND OF FLORIDA

By R. S. Dyal. Soil Sci. Soc. Amer. Proc. 17: 55-58. 1953.

This paper reports the occurrence of mica leptyls as the principal constituent and wavellite a minor constituent of the clay fraction from Gainesville loamy fine sand of Florida. The mineralogical compositions of clay fraction from seven soils of the lower Gulf Coastal Plain are compared. Methods used for identification are differential thermal analysis, X-ray diffraction, surface area measurements, chemical analysis, and observation under the electron microscope. Leptyls of mica comprise 60 to 80% of the mineralogical composition of the clay fraction of Gainesville loamy fine sand. Four to 7% of the clay fraction consists of wavellite. Ten to 15% of the clay fraction is kaolinite with some quartz present in the 2- to 0.2μ fraction. The clay fraction from the seven soils of the lower Gulf Coastal Plain is predominantly kaolin or kaolin-gibbsite mixtures.

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COMPACTION AS A FACTOR IN SOIL CONSERVATION

By G. R. Free. Soil Sci. Soc. Amer. Proc. 17: 68-70. 1953.

The results of recent studies in New York of soil compaction as related to infiltration and percolation of water are presented and discussed. By using treatments affecting the amount of surface compaction occurring under natural rainfall, the ratio of infiltration to runoff for one soil was varied over a range of 300 to 600%. Compaction and permeability of another soil within and below plow depth was shown to be related to traffic and other factors of soil and crop management. Some of the broad aspects of the soil compaction problem are discussed.

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THE SIGNIFICANCE OF AIR ADSORPTION BY SOIL COLLOIDS IN PICNOMETRIC MEASUREMENTS

By V. C. Jamison. Soil Sci. Amer. Proc. 17: 17-19 1953.

Pressure deficits from calculated values in picnometric measurements on dry soils have been observed. The explanation given is gas adsorption by dry soil colloids. The magnitude of this source of error in picnometric soil porosity measurements and its relationship to soil moisture was studied. A dual chamber picnometer adapted to measuring gas adsorption over a wide range of pressures was used. For the soils used the results were essentially the same for air and oxygen. The air picnometer cannot be used to estimate porosity or moisture content of soils near or below air dryness unless a method based on direct calibration of fixed fresh soil weights in used.

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PHYSICOCHEMICAL INVESTIGATIONS OF CLAY-ADSORBED ORGANIC COLLOIDS II

By F. J. Stevenson, Q. Van Winkle, and W. P. Martin. Soil Sci. Soc. Amer. Proc. 17: 31-34. 1953.

The purpose of this study was to determine the sedimentation velocity and free diffusion behavior of humic acid extracted from Miami clay with neutral sodium pyrophosphate solution. In addition the organic colloids extracted from several soils of the Miami catena were analyzed using the electrophoretic technique. The electrophoresis examination indicated that the organic colloids extracted from the clay fractions of a Brookston, Crosby, and Miami soil were similar. In all cases, it appeared that the extract consisted mainly of dark colored humic acid, with two additional colloids present in very small quantities. The sedimentation velocity and free diffusion study showed that the humic colloid isolated from Miami clay was polydisperse with respect to particle size.

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THE THERMAL CONDUCTIVITY PROBE

By F. C. Hooper. Natl. Res. Council, Highway Res. Bd. Spec. Rpt. 2: 57-59. 1952.

A thermal conductivity probe which measures the thermal properties of soils is described and its use illustrated. It utilizes a transient heat-flow principle. Tests can be accomplished in a few minutes before moisture migration has significantly disturbed the original distribution.

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FIELD MEASUREMENTS OF SOIL TEMPERATURES

By H. H. Miller. Natl. Res. Council, Highway Res. Bd. Spec. Rpt. 2: 60-63. 1952.

This progress report covers the results of field measurements of soil temperature made under a 3-in. flexible asphalt carrying an average of 534 vehicles per day. The project began Dec. 4, 1949, and ended Dec. 31, 1950. Thermocouples were installed at 6, 12, 18, 30, 42, 54, and 66 in. below the surface of the pavement and one at atmospheric exposure. These thermocouples were attached to an automatic Leeds and Northrup 8-point recording thermometer placed in a heated room of a building about 40 ft. from the road. The chart's ranges were from -25°F. to 125°F., 40 yards long, recording 8 times per hour, changed at 35-day intervals.

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METHODS FOR MEASURING THE MOISTURE CONTENT OF SOILS UNDER FIELD CONDITIONS

By G. J. Bouyoucos. Natl. Res. Council, Highway Res. Bd. Spec. Rpt. 2: 64-71. 1952.

The plaster-of paris and nylon electrical-resistance methods have been found to be the most satisfactory means now available for measuring soil moisture content under field conditions. Neither one is perfect, but if properly used they will give valuable results. For determining total water content over a wide range and by a more or less permanent method, the nylon is definitely superior to the plaster-of-paris method. On the other hand, the plaster-of-paris method has the distinct advantage of possessing considerable buffer action, and can measure the range of moisture content from less than 1 atmosphere to more than 15 atmospheres tension in practically all soils without calibrating the method for each individual soil. The nylon unit, however, possesses great promise, especially in view of recent improvements, including (a) a standardized technique of manufacturing it; and (b) the use of stainless steel in place of the monel electrodes and case. Stainless steel does not corrode in the soil, while monel metal corrodes badly in many soils, and the corrosion products tend to destroy the insulating property of the nylon fabric.

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THERMAL PROPERTIES OF SOILS

By M. S. Kersten. Natl. Res. Council, Highway Res. Bd. Spec. Rpt. 2: 161-166. 1952.

Numerical values of the various constants permit mathematical checks of various heat-transfer problems in connection with frost action in soils. The numerical values of specific heat and thermal conductivity given in this paper, with which diffusivities may also be calculated, are offered for use in such calculations.

EFFECT OF SAMPLE DRYING ON THE DETERMINATION OF THE WATER-STABILITY OF SOILS

By C. S. Slater. Soil Sci. Soc. Amer. Proc. 17: 75-76. 1953.

This paper reports the effects of air drying soil samples at different temperatures as indicated by the results of water-stability analyses. It is concluded that if the samples are air dried at rates and temperatures that are characteristic of ordinary variations in laboratory conditions, the variations of stability so induced do not modify greatly the relative levels of stability represented by the samples. However, the induced variation was greater, over a temperature range of 40° F. to 180° F. than that between duplicate analyses.

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MOISTURE CONTENT OF SMALL STONE IN SOIL

By T. S. Coile. Soil Sci. 75: 203-207. 1953.

This paper reports the results of a study made to determine the moisture content of small stones in the soil and their contribution to the moisture needs of the plants. The soils studied were developed from consolidated rocks of the Piedmont Plateau region, and the small stones contained in them are weathered fragments of the underlying sedimentary or crystalline rocks. It was concluded that the stones contribute to the water supply available to plants.

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SOIL TEMPERATURE COMPARISONS UNDER VARYING COVERS

By G. A. Crabb, Jr., and J. L. Smith. Highway Res. Bd. Bul. 71: 32-80. 1953.

Vegetation exerts a direct influence upon soil temperature as well as an indirect influence upon almost every other factor affecting soil temperature changes and other hydraulic factors. Temperature variations in the soil in relation to depth, cover, and air are listed and discussed.

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COMPARISON OF METHODS OF MECHANICAL ANALYSIS OF SOILS

By J. A. Toogood and T. W. Peters. Canad., Jour. Agr. Sci. 33: 159-171. 1953.

The Casagrande, Bouyoucos, and pipette methods for mechanical analysis of soils were studied. The Bouyoucos and Casagrande methods gave a lower percentage of clay than the pipette method if either the clay content or organic matter content of a soil was high. Differences of over 20 percent were observed. When soils were pretreated with hydrogen peroxide, the Bouyoucos method gave higher percentages of clay than the pipette while the Casagrande method gave lower percentages. Differences in percentages of sand found by the various methods were small. The peroxide treatment was considered essential, regardless of the method used, for all soils containing appreciable amounts of organic matter; the Casagrande method gives too low a percentage of clay, and with peroxide treatment, is too tedious for practical use; the Bouyoucos method could be used as a rough analysis only for soils low in organic matter; and the pipette method results in too low a percentage of clay due to over-drying the sample. A revised procedure is suggested.

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STANDARD ADSORPTION POTENTIALS OF WATER VAPOR ON SOIL COLLOIDS

By J. R. Goates and C. V. Hatch. Soil Sci. 75: 275-278. 1953.

The B.E.T. multilayer adsorption equation of gases by solids is developed by a thermodynamic approach which shows the constant of the B.E.T. equation to be related to the standard Gibbs free energy of adsorption for the first layer. The usefulness of this adsorption potential as a means of characterizing the surfaces of soil colloids is pointed out. The B.E.T. constants, the surface area, and the standard adsorption potentials at 25° C. are calculated for the adsorption of water vapor on four soil colloids.

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PRESSURE DISTRIBUTION IN LAYERED SOILS DURING CONTINUOUS WATER FLOW

By P. R. Day and J. M. Luthin. Soil Sci. Soc. Amer. Proc. 17: 87-91. 1953.

The occurrence of a pressure deficiency ("tension") in the liquid phase of flooded, freely drained soils has been observed in texturally stratified columns in the laboratory. A moderately permeable surface soil over a highly permeable substratum presents an excellent opportunity for the development of tension in the soil during flooding operations. The practical implications of this fact are discussed with reference to water spreading investigations.

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REMOVAL OF COATINGS FROM SOIL PARTICLES FOR PETROGRAPHIC ANALYSIS

By R. P. Matelski. Soil Sci. Soc. Amer. Proc. 17: 103-106. 1953.

Detergents and builders have been used successfully to remove the organic and inorganic coatings from soil particles prior to petrographic analysis. Essentially, the procedure consists of triturating the soil sample in a liter beaker with a cationic detergent, dilution and decantation of the clay and fine silt, followed by several triturations with an anionic detergent and builders, dilution and decantation of the clay and fine silt.

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WATER RETENTION AND AVAILABILITY IN SOILS RELATED TO DROUGHT RESISTANCE

By J. J. Lehane and W. J. Staple. Canad. Jour. Agr. Sci. 33: 265-273. 1953.

Observed differences in the available waterholding capacity of different textural classes of soils were not sufficient to account for the relative droughtiness of the soils. In most years the better soils in the Swift Current area, varying from medium loams to heavy clays, could hold, within the depth of root penetration, all the moisture that reached the subsoil. Moisture release curves for different textural classes of soils are presented. It is suggested that the greater drought resistance of crops on the fine textured clays might be related to the fact that the available moisture in these soils is held under greater stress than the moisture in lighter soils.

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CLAY MINERAL TYPES AND RELATED SOIL PROPERTIES IN PUERTO RICO

By F. Abruna and R. M. Smith. Soil Sci. 75: 411-420. 1953.

The purpose of this paper is to show that variations in certain important soil properties are related to identified clay minerals, whereas other properties may not reflect clay mineral types as expected from the behavior of pure mineral specimens. By such considerations, it is hoped that a sounder basis of understanding of soil influences can be established, both in technical research and in farm practice.

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Soil Chemistry

CATION-EXCHANGE GROUPINGS IN THE SOIL ORGANIC FRACTION

By F. E. Broadbent and G. R. Bradford. Soil Sci. 74: 447-457. 1952.

The authors attempted quantitatively to relate cation exchange in the soil organic fraction with groupings capable of furnishing acidic hydrogen. The ability of cation-exchange groupings in the soil organic fraction to form esters and ethers with methylating agents indicates that the majority of these groupings are probably carboxyl and phenolic or enolic hydroxyl.

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FIELD TEST FOR ACTIVE SULFIDES IN SOIL

By J. W. Neckers and C. R. Walker. Soil Sci. 74: 467-470. 1952.

This study indicated that there is a general correlation between the total sulfur and the lead acetate field test as applied to shales found in coal strip-mine wastes.

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A TURBIDIMETRIC POTASSIUM DETERMINATION AFFECTED LITTLE BY TEMPERATURE

By R. V. Olson. Soil Sci. Soc. Amer. Proc. 17: 20-26. 1953.

A modification of the turbidimetric cobaltinitrite method for determining potassium is presented. The method is applicable to use in routine soil testing laboratories. The method is not appreciably affected by temperature changes over the temperature range of 15° to 35° C. but is subject to errors at greater temperatures. Comparisons of the effect of temperature on this method with two methods now in common use showed it to be subject to less error. The effects of temperature have been minimized by modifying the usual techniques in two ways: (1) by selecting the proper wave length and adjusting the photometer with a blank solution to prevent measurement of the amount of color in the solution phase, and (2) by introducing sodium cobaltinitrite powder directly into the potassium solution-alcohol mixture, resulting in slow formation of the potassium precipitate.

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CHEMICAL PROPERTIES OF ALKALI SOILS IN MESILLA VALLEY, NEW MEXICO

By C. W. Chang. Soil Sci. 75: 233-242. 1953.

Preliminary field and laboratory studies of 87 samples for profiles of alkali and productive soils show that all the soils are calcareous, nongypsiferous, and rather low in organic matter content, and that outstanding differences between alkali and productive soils lie in the exchangeable sodium, exchangeable sodium percentage, pH of saturation paste, pH of 1:5 suspensions, and total soluble salts.

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ADSORBED PHOSPHORUS IN HIGH-LIME ONTARIO SOILS

By J. W. Ketcheson and R. H. Bray. Canad. Jour. Agr. Sci. 33: 141-146. 1953.

High-lime alkaline soils exhibited a range of adsorbed phosphorus values, the higher of which exceeded any found in high-lime non-alkaline soils. This study indicates that significant levels of adsorbed phosphorus can be present, even in high-lime soils.

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A MICROSCOPIC STUDY OF PLATY AND CONCRETIONARY STRUCTURES IN CERTAIN SASKATCHEWAN SOILS

By N. J. McMillan and J. Mitchell. Canad. Jour. Agr. Sci. 33: 178-183. 1953.

Thin sections of platy A_2 horizons of several soils which developed under podzolization or solonization processes were studied. A synthetic resin was used to impregnate and fix the soil aggregates so that slides for microscopic study could be made. A "banded fabric" was revealed in the platy horizons of podzolized soils. The platy A_2 horizon of a solonetzic soil revealed an "isoband fabric" as did the A_2 of a podzolic-solonetzic soil. "Wrinkle-marks" and "invasion amygdali" were also noted in samples from A_2 horizons of podzolized soils. It is suggested that the thin section technique might well be applied in studying pore space and channel arrangement in soils, as well as aggregates of all types.

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LIMING MATERIALS IN SOILS--RADIOCHEMICAL MEASUREMENT OF REACTION RATES

By D. H. Smith, J. M. Blume, and C. W. Whittaker. Jour. Agr. and Food Chem. 1: 67-70. 1953.

This investigation was intended to demonstrate the usefulness of radiocalcium in evaluating liming materials, and to develop a radiochemical method applicable to the study of natural materials, yet subject to fewer obvious errors than those associated with commonly used techniques. It was found that reaction rates of liming materials could be followed by tagging the calcium of the exchange complex of a soil, incorporating the liming material, and determining the specific activity of the calcium in successive crops grown on the system. The methods developed provide a more direct means of evaluating limestones and slags than was previously available.

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PHOSPHATE RESPONSE, BASE SATURATION AND SILICA RELATIONSHIPS IN ACID SOILS

By H. F. Birch. Jour. Agr. Sci. 43: 229-235. 1953.

The inverse relationships described in an earlier publication between phosphate response and the degree of base saturation was confirmed with three further groups of field experiments. Soil pH may be employed as an alternative to the degree of base saturation.

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CATION UPTAKE BY PLANTS AS AFFECTED BY AN APPLIED POTENTIAL

By E. L. Breazeale and W. T. McGeorge. Soil Sci. 75: 443-448. 1953.

Further experimental evidence is presented in support of the theory that cation uptake by plants is an electrical phenomenon. Uptake of Na, K and Ca is actively stimulated at the respective potentials of these cations. By using two polarographs and two separate reservoirs containing different salt solutions, the uptake of two cations by a single plant can be stimulated.
An experimental technique is presented to show how the polarograph can be useful in a study of ion uptake by plants by supplying a source of controlled direct current voltage. It may be particularly useful for studying uptake of cations in excess or luxury amounts.

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SOIL MINERALOGY AS IN INDEX TO THE TRACE-ELEMENT STATUS OF SOME AUSTRALIAN SOILS

By E. R. Graham. Soil Sci. 75: 333-343. 1953.

This is a report of an investigation into the possible relationships between certain soil minerals and the trace-element status of some soils. The degree of weathering as established by analysis for quartz, feldspar, and heavy minerals was found to be high for soils of known and suspected deficiency, and to be moderate to low in soils nondeficient in trace elements. High amounts of gibbsite were found in the 2-20 μ fraction of soils from areas demonstrated to be copper deficient. Gibbsite was not found in samples of any of the nondeficient soils. The ferromagnesium, ferrocalcium minerals were not found among the heavy mineral assemblages of copper-deficient or suspected copper-deficient soils. Soils of known molybdenum and suspected molybdenum-deficiencies were characterized as highly weathered. They contained a very high percentage of quartz and extremely low amounts of feldspars. A very low amount of ferromagnesium, ferrocalcium minerals was found in some of the samples. Molybdenum-deficient soils, in general, were characterized by a very small amount of weatherable minerals in the heavy fraction.

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SOME ASPECTS OF THE CHEMISTRY OF COBALT IN SOILS

By D. K. Banerjee, R. H. Bray, and S. W. Melsted. Soil Sci. 75: 421-431. 1953.

This paper describes attempts to determine the completeness of extraction of cobalt by some commonly used solutions under varying soil conditions and to establish the nature of the forms that added cobalt assumes in the soil. By using tracer techniques with Co60 as the radioactive source, it was found that cobalt added to the soil existed in both easily exchangeable and strongly adsorbed forms.

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WEATHERING OF GLACIAL SOIL MATERIAL

By J. C. F. Tedrow and A. S. Wilkerson. Soil Sci. 75: 345-353. 1953.

This paper infers different chemical and mineralogical conditions in the soils of the various glacial drifts by studying alteration products of selected rock specimens of the drifts.

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CATION EXCHANGE IN SOILS THROUGH THE MOISTURE RANGE, SATURATION TO THE WILTING PERCENTAGE

By D. A. Brown. Soil Sci. Soc. Amer. Proc. 17: 92-96. 1953.

Data are reported to show the effect of soil moisture upon cation exchange in soils, through the range from saturation to wilting percentage, for seven soil series. The cation exchange-moisture relationships are explained on the basis of the relative abundance and continuity of the water films within the pore system of the soil that may effectively serve as a medium for the diffusion of cations through the soil.

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THE IDENTIFICATION OF CLAY MINERALS IN SOME ONTARIO SOILS: 1. PARENT MATERIALS

By L. R. Webber and J. A. Shivas. Soil Sci. Soc. Amer. Proc. 17: 96-99. 1953.

The colloidal fractions, one micron and less, from the parent materials of nine Ontario soils were examined by the differential thermal method and by chemical analyses. An attempt was made to characterize these fractions in terms of their clay mineral composition by comparison.

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Soil Biology

THE MICROBIOLOGY OF FOUR STEAMED SOILS

By C. D. Axley and E. A. Gray. Jour. Agr. Sci. 42: 353-361. 1952.

Four soils sterilized by steam at 100°C. and unsteamed controls for three soils were examined at intervals up to 62 days to study the microbiology in relation to the abundance of ammonia, nitrites, and nitrates of all soils, the C/N ratios of two, and the pH and moisture content of three. After steaming, the soils were flooded with sterilized tap water equivalent in amount to 3 inches of rainfall at intervals varying with the particular soil. The soil of the first trial remained under water until very near the end of the experiment. In all the soils, the production of ammonia up to 14 days after steaming was associated with increased biological activity, generally a multiplication of bacteria associated with multiplication of protozoa. The production of nitrites and nitrates was associated with a similar biological activity. Those bacteria that survived steaming had simple growth requirements as compared with those of the subsequent microflora.

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DISCOVERIES IN NITROGEN FIXATION

By M. D. Kamen. Sci. Amer. 188: 38-49. 1953.

Until recently only a few microorganisms were thought to fix the nitrogen of the atmosphere in the form essential to higher plant and animal life. Now a number of others have been found. This paper reports the progress made in our knowledge of nitrogen fixers during the past three years.

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FUNGITOXINS IN THE SOIL. II. TRICHOTHECIN, ITS PRODUCTION AND INACTIVATION IN UNSTERILIZED SOILS

By D. G. Hessayon. Soil Sci. 75: 395-404. 1953.

Experiments are described which suggest that an established antibiotic, Trichothecin, is synthesized by the fungus *Trichothecium roseum* when grown in a variety of unsterilized soils. Clay soils had a higher trichothecin-producing capacity than sandy ones. Trichothecin was strongly adsorbed by soil, but very little biological breakdown occurred.

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HERBICIDES--RESIDUES IN SOIL

By R. J. Aldrich. Jour. Agr. and Food Chem. 1: 257-260. 1953.

Critical factors of the hazards of herbicide residues are the effect on soil microorganisms and soil properties and removal of herbicides from soil. 2,4-D is relatively nontoxic to most soil organisms at concentrations ordinarily used for weed control. Certain other herbicides appear to be very inhibitory to microbial activity. Herbicides or effects of herbicides are removed from soil by leaching, retention by the soil colloids, decomposition, and volatilization. Soil microorganisms decompose many herbicides; soil moisture, soil temperature, and other factors most conducive to microbial activity are conducive to herbicide decomposition. Volatility may be an important factor in the removal of a herbicide from soil.

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AMMONIUM FIXATION IN SOILS

By F. E. Allison, M. Kefauver, and E. M. Roller. Soil Sci. Soc. Amer. Proc. 17: 107-110. 1953.

Laboratory experiments are reported which show the extent to which representative soils of the United States are able to fix ammonium, and the effect of various factors on fixation and on the availability of fixed ammonium to nitrifying bacteria.

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NUTRIENTS AND PIGMENTATION: SOME FACTORS AFFECTING PIGMENTATION OF AZOTOBACTER CHROOCOCCUM

By G. R. Anderson and J. V. Jordan. Jour. Agr. and Food Chem. 1: 523-526. 1953.

Boron is utilized by the azotobacter cell and exerts a positive effect upon pigment production and pigment coloration of *Azotobacter chroococcum*. Optimum pigmentation in nitrogen-free media occurred at concentrations of 70 ppm of boron and 1.0 ppm of copper. *Azotobacter chroococcum* appears to contain a Dopa oxidase system which produces the pigment, melanin. High concentration of boron appears to inhibit pigment production when an optimum concentration of copper is present. When used as the source of nitrogen, tyrosine and glutamic acid increased pigment by *Azotobacter chroococcum*.

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Soil-Plant-Animal Relationships

TRACE ELEMENT DEFICIENCIES, WATER-CULTURE CROPS DESIGNED TO STUDY DEFICIENCIES IN ANIMALS

By J. F. McClendon and J. Gershon-Cohen. Jour. Agr. and Food Chem. 1: 464-466. 1953.

Experiments were carried out in order to obtain diets lacking halogens and sodium particularly for the study of iodine and fluorine deficiency in rats. A water-cultured crop was obtained with successful elimination of halogens or sodium. With natural foodstuffs devoid of iodine, fluorine, or sodium, the effect on experimental animals can be definitively determined. Conversely, the optimum amount of these halogens or sodium for fertilization can be ascertained.

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Soil Genesis, Formation, Classification and Mapping

MAJOR KINDS OF PROFILES AND THEIR RELATIONSHIPS IN NEW YORK

By M. G. Cline. Soil Sci. Soc. Amer. Proc. 17: 123-127. 1953.

The Zonal soils of New York are members of the Gray-Brown Podzolic, Brown Podzolic and Podzol great soil groups. Each dominates the best-drained sites of extensive areas, but each is associated locally with a complete catena controlled by ground-water relationships. In addition, Brown Forest soils occupy the best-drained sites on some highly calcareous materials, and Alluvial soils occur, recent alluvium. Each of these is also associated with a complete catena.

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SUGGESTED TERMINOLOGY FOR DESCRIBING SOILS AS THREE-DIMENSIONAL BODIES

By F. D. Hole. Soil Sci. Soc. Amer. Proc. 17: 131-135. 1953.

Many papers on soil classification emphasize soil characteristics as revealed in the relatively narrow vertical cross-sections of soil called soil profiles. The assumption is generally made that the soils, from which the profile descriptions are taken, extend laterally far enough to constitute segments of landscapes. But terminology has not been developed sufficiently to permit both horizontal and vertical aspects to be considered in the description and classification of soils. Some terms are suggested which have been found useful in describing Wisconsin soils as three-dimensional bodies.

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SOIL MAPPING BY STEREOSCOPIC INTERPRETATION OF AIRPHOTOS

By J. K. Pasto. Soil Sci. Soc. Amer. Proc. 17: 135-138. 1953.

In many areas, it appears possible to map soils, with some generalization, by combining steroscopic interpretation of aerial photographs with field checks. As a test of this technique, the soil series were mapped on 4,000 acres in the glaciated region of southern New York. The area was then mapped on foot in the usual manner. The stero results came remarkably close to representing the true field conditions.

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ANOMALOUS GLACIAL DEPOSITS IN THE COLORADO FRONT RANGE AREA, COLORADO

By R. L. Ives. Amer. Geophys. Union Trans. 34: 220-226. 1953.

Reinvestigation of reported glacial deposits in the Colorado Front Range area, in locations above or exterior to those commonly classed as glaciated, has resulted in a doubling of the number of known deposits, and the finding of a rough gradation from glacial near the Arapaho Massif through reworked glacial at distances of six or seven miles, to glacio-fluviatile and fluviatile at greater distances. From this evidence, one or more early Pleistocene glaciations are postulated, the parent ice body being of the ice-cap type resting upon a gently rolling terrain of which the so-called peneplain surfaces now remain. A similar large ice cap in the Laramie-Poudre area is suggested by scattered evidence between those rivers and the Laramie-Fort Collins highway.

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SOME RELATIONSHIPS BETWEEN THE CLASSIFICATION OF ROCKS BY GEOLOGISTS AND THE CLASSIFICATION OF SOILS BY SOIL SCIENTISTS

By E. P. Whiteside. Soil Sci. Soc. Amer. Proc. 17: 138-142. 1953.

A unified philosophy is presented by some of the basic relationships between the classification of rocks by geologists and the study of soils for students and teachers in these fields. These include the differentiation of rocks and soils, the definition of parent rock, and a suggested approach to the classification of parent rocks.

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VEGETATIONAL APPROACH TO SOIL SURVEYS IN WILDLAND AREAS

By A. E. Wieslander and R. E. Storie. Soil Sci. Soc. Amer. Proc. 17: 143-147. 1953.

This paper describes methods employed in the concurrent mapping of vegetation and soil on more than 3 million acres of mountainous land in California. The land is classified according to vegetational types, age and density of timber stands, timber site quality, and series and depth of soil.

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HYDROLOGY

General

EXPERIMENTAL CONFIRMATION OF HYDROMETER THEORY

By P. R. Day. Soil Sci. 75: 181-186. 1953.

This paper describes an experiment designed to test the validity of the hydrometer theory. The hydrometer method was compared with the pipette sampling method on suspensions prepared by identical pre-treatment and dispersion procedures.

It was concluded that the reliability of the method is dependent somewhat on the accuracy with which the particle density can be estimated.

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MOVEMENT AND EQUILIBRIUM OF WATER IN HETEROGENEOUS SYSTEMS WITH SPECIAL REFERENCE TO SOILS

By P. F. Low and J. M. Deming. Soil Sci. 75: 187-202. 1953.

The total potential concept was applied to the movement and equilibrium of water in heterogeneous systems such as the soil. A general equation was developed, showing the change in the positional potential energy of the constituent and to changes in concentration, also, to changes in pressure and in temperature occurring in that process. The presence of gravitational, electrostatic, and van der Waals force fields in the system was considered to be responsible for the positional energy of the water in the soil. The hypothesis was made that the rate of movement of the water in the soil is directly proportional to the driving force, which was regarded as equal to the negative gradient of the total potential of the water. On the basis of this hypothesis and the general equation for the total potential, an equation for the velocity of water in a heterogeneous system was developed. Integration of the general equation produced a second general equation expressing the equilibrium pressure difference between any two phases as a function of the concentration ratio and positional potential energy difference for any constituent distributed between the two phases.

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THE EFFECT OF SURFACE HEAD ON INFILTRATION RATES BASED ON THE PERFORMANCE OF RING INFILTROMETERS AND PONDS

By L. Schiff. Amer. Geophys. Union Trans. 34: 257-266. 1953.

Studies with infiltrometers and small ponds indicate that the normal relatively low infiltration rates of certain soils may be increased by providing sufficient depth of water or surface head on the soil surface. Infiltration rates increased directly proportional to head motivating flow in infiltrometers on untreated soil under water-spreading conditions. Hydraulic head loss and length of saturated soil column explain why greater increases in infiltration rates occurred with increases in surface head on untreated soil than on a soil rendered more permeable by treatment. Hydraulic head losses were obtained with infiltrometers equipped with manometers located 1-1/2, 4-1/2, and 7-1/2 in. below the soil surface. The resistance of untreated soil to flow reduced the total head motivating flow to a negligible amount at a depth of 7-1/2 in. below the soil surface. Where hydraulic head exists at the bottom end of an infiltrometer extending into the soil, the need for a "balanced buffer" rather than a "partial buffer" or an "excessive buffer" to prevent lateral flow is discussed. Piezometric heads in relatively pervious soil horizons below the soil surface within and outside of a pond are reported.

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RELATIONSHIP OF THE MINERAL CONSTITUENTS IN SOLUTION TO STREAM FLOW, SALINE RIVER NEAR RUSSEL, KANSAS

By W. H. Durum. Amer. Geophys. Union Trans. 34: 435-442. 1953.

Studies were made of the salinity relationships of ground-water inflow in the Saline River basin, Kansas, during the period 1945-49 in connection with the program of the Interior Department for development of the Missouri River basin. Mineralization in the Saline River near Russell, Kansas, fluctuates rapidly from more than 4400 ppm in low water stages to approximately 200 ppm at flood stage. Hydrographs for the 1947 and 1948 water years reveal that surface runoff comprized approximately 65% of the total runoff for each year and carried an estimated 24% of the annual dissolved solids discharge. The dissolved minerals in surface runoff were derived from surface contact and channel scour. In contrast, runoff from groundwater sources contributed 35% of the total runoff and 76% of the annual dissolved solids discharge.

Ground water discharging to the Saline River and its tributaries carries strong concentrations of dissolved minerals that are leached from saliferous and gypsiferous shales and sands of the consolidated materials. Sodium, chloride, and sulfate are the most prominent constitutents. Chloride concentrations of more than 1900 ppm were identified with low flow and the chloride ion is related hyperbolically to stream flow. Equations were developed by the least-squares principle to correlate between specific conductance of the water and several mineral constituents in solution.

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GEOCHEMICAL RELATIONSHIPS OF WATER IN THE POWDER RIVER BASIN, WYOMING AND MONTANA

By H. A. Swenson. Amer. Geophys. Union Trans. 34: 443-448. 1953.

Geologic factors largely determined the composition and the amounts of dissolved solids that are transported by the Powder River and its tributaries. The chemical character of the water in the basin differs widely from one stream to another and is variable in each stream from headwaters to mouth. Mountainous areas underlain by igneous rocks of Precambrian age contribute small quantities of soluble materials to the river system; the concentration of mineral solids may be less than 50 ppm. Streams heading in upland country and draining a region that is largely underlain by Tertiary sandstones and shales transport salts in concentrations exceeding 2000 ppm. The composition of mineral substance in the river water can be correlated with occurrence in the area of such rocks as granite, limestone, gypsum, and shale.

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A METHOD OF FORECASTING LOW FLOW OF STREAMS

By H. C. Riggs. Amer. Geophys. Union Trans. 34: 427-434. 1953.

This paper presents a method of forecasting the discharge of streams during periods of low flow by use of normal base-flow depletion curve and frequency curves of runoff from concurrent precipitation and snow melt. Base flow from antecedent precipitation, together with runoff from concurrent precipitation and snow melt, constitutes the total runoff. The base flow resulting from antecedent precipitation may be projected several weeks or, in some cases, months into the future. The added runoff from subsequent precipitation may be evaluated by a frequency curve of such runoff component from past records. If the latter component is not great in relation to base flow, reliable forecasts of total flow are possible. The method is illustrated by application to two streams in the Columbia River Basin where conditions are favorable to its use.

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ACCURACY OF DETERMINATION OF ANNUAL PRECIPITATION OVER A GIVEN AREA

By E. E. Sanderson and D. O. Johnstone. Amer. Geophys. Union Trans. 34: 49-57. 1953.

The limits within which the total precipitation as measured by a single gage represents the total precipitation over the surrounding area is a subject of great interest to hydrologists and meteorologists. The lack of adequate data from large areas has made detailed analytical studies impossible. The precipitation-gage network established during the period from 1935 to 1940 in the Muskingum River Watershed in Ohio by the U. S. Soil Conservation Service provides data for limited studies for an 8,038 square mile area. Records from 230 gages for a full year beginning October 1, 1939, are available. The data from these stations have been used by the authors to analyze the effect of gage spacing on the accuracy of determination of the amount of annual precipitation for areas in Ohio ranging in size from a few square miles to 8,000 square miles.

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RAINFALL AND TOPOGRAPHIC FACTORS THAT AFFECT RUNOFF

By W. D. Potter. Amer. Geophys. Union Trans. 34: 67-73. 1953.

Based on runoff records for the period 1938-48, peak-rate probability curves are computed for 51 watersheds located in the Allegheny--Cumberland Plateau and ranging in size from 100 to 350,000 acres. A simple correlation is computed to determine the relationship between the peak rate for a ten-year recurrence interval and area. The average standard error was 34.8%. Two rainfall factors representative of the period of runoff record are then introduced together with a topographic factor, and a multiple correlation equation to determine the peaks that would have resulted from the peak-rate probability curves had long-term runoff records been available. Relationships between ten-year peaks and those for 25- and 30-year frequencies are determined from the peak-rate probability curves and the Plateau is divided into two zones based on these relationships.

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CHARACTERISTICS OF TIPPING-BUCKET DEVICES

By H. L. Cook and D. A. Parsons. Amer. Geophys. Union Trans. 34: 85-94. 1953.

The results of tests and a description of the behavior of a tipping-bucket gage for use in flow measurements are given. Procedures for the use of these devices to obtain as reliable flow data as possible are indicated. It is concluded that, because of the large head room required and the low capacity in addition to the poor hydraulic characteristics, this type of instrument is unsuitable for adoption for general use in the measurement of soil and water runoff from experimental areas.

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Climatology

SOIL MOISTURE TENSION AS A MEASURE OF WATER REMOVAL RATE FROM SOIL AND ITS RELATION TO WEATHER FACTORS

By G. Ashcroft and S. A. Taylor. Soil Sci. Soc. Amer. Proc. 7: 171-174. 1953.

The moisture tension in the soil at any specified time can be expressed as a function of depth. When it is possible to express the moisture content as a function of tension, it is then possible to express moisture content as a function of depth in the soil. The equation relating moisture content and depth is integrated over the depth of the root zone to give the total quantity of water in the soil. The quantity of water in the soil at any time is then subtracted from the amount which can be held without excessive deep percolation occurring. The difference represents the amount of water that can be retained by the soil from an irrigation. This amount should be increased by the runoff, evaporation, and the other expected losses, in order to determine the quantity of water that should be applied at an irrigation.

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STATUS OF POSSIBILITIES OF ARTIFICIAL PRECIPITATION

By F. Hall. Amer. Geophys. Union Trans. 33: 866-870. Dec. 1952.

Cloud seeding with dry ice or silver iodide is designed to increase the ice-crystal content of clouds containing supercooled liquid water droplets, and thereby to permit the growth of precipitation elements (snowflakes or raindrops) by diffusion from water droplets to the induced ice crystals. Uncertainties as to need for additional ice crystals in clouds of appreciable water content make it difficult to estimate the potential value of cloud seeding in producing increased precipitation. Tests thus far have shown that it is often possible to produce slight amounts of precipitation from the bases of clouds, the rain reaching the ground on some occasions. Further research, both in the field and in the laboratory, will be needed to determine quantitatively the significance of cloud seeding in augmenting the Nation's water resources. A short bibliography is furnished.

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FROST ACTION IN ROADS AND AIRFIELDS

By. A. W. Johnson. Natl. Res. Council Highway Res. Bd. Speç. Rpt. 1. 1952

This is a review of the literature on frost action in soils--the first step in attempting to solve the problem created by frost action in roads and airfields. This review was prepared to help investigators understand what has already been accomplished and thus prevent unnecessary duplication of work which has been reported. Newly developed engineering information is not readily accepted and put to use unless all engineers keep pace with developments. It is believed this presentation will also be useful to practicing engineers by not only acquainting them with design methods but also by broadening their concepts of the basic phenomenon of soil freezing.

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SOIL TEMPERATURE: A REVIEW OF PUBLISHED RECORDS

By C. B. Crawford. Natl. Res. Council Highway Res. Bd. Spec. Rpt. 2: 17-41. 1952.

This review shows clearly that a wealth of information is available in published records or even such a specialized subject as soil temperature variations. Correspondingly, the survey of the available published information shows evident gaps in the overall picture of soil-temperature phenomena and points the way clearly to a number of relevant questions still unanswered. All the records of soil-temperature variation with depth follow the pattern which would be expected from the basic physics of the problem, having regard to the internal heat of the earth and the variations in air temperature and solar radiation. Variations in soil temperature close to ground surface, however, show themselves to be susceptible to a number of other factors, some of which are controllable. As studies have progressed, it has become clear that the water present in soil affects internal heat flow in a much more complex manner than its presence might ordinarily suggest. Almost all records omit any reference to the position of the ground-water table at the experimental site. Of equal significance is the almost complete neglect of the density or state of compaction of the soils in which records have been taken. Enough is now known, however, to render possible the suggestion that upon these two factors in particular depends to a large extent the full understanding of frost action in soil.

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Land Use Influences

WATERSHED MANAGEMENT IN THE COLORADO ROCKIES

By L. D. Love. Jour. Soil and Water Conserv. 8: 107-112. 1953.

Studies in the Colorado Rockies strongly suggest that water yields can be increased by as much as 30% when dense, virgin stands of lodgepole pine and Englemann spruce are thinned by the harvesting of the mature timber. Under the desirable cutting practices, probably less than half of any unit would be harvested at one time and thus periodic harvesting and judicious thinning of young stands may produce a permanent increase of up to 15% in water yield. Erosion can be controlled through good cutting practices.

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COMPARATIVE ANALYSIS OF HYDROGRAPHS FROM SIMILAR STORMS ON A WATERSHED UNDER TIMBERED AND CLEARCUT CONDITIONS

By J. L. Smith and G. A. Crabb, Jr. Mich. Agr. Expt. Sta., Quart. Bul. 35, 489-502. 1953

A recent change in management practices of the wooded watershed of the Michigan Hydrologic Research Station provided one year of little or no cover-conditions which may be satisfactorily compared with previous timbered conditions. In the light of this tentative and preliminary analysis of similar storms under different cover conditions, it is anticipated that the removal of a timbered cover will have a profound effect upon the absorption of precipitation by a watershed. Runoff will be probably occasioned by storms having smaller intensities and totals of precipitation, and erosion losses will be consequently greater.

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INFLUENCE OF FOREST COVER ON THE STATE OF THE GROUND WATER TABLE

By S. A. Wilde, E. C. Steinbrenner, R. S. Pierce, R. C. Dosen, and D. T. Pronin. Soil Sci. Soc. Amer. Proc. 17: 65-67 1953

The state of the ground water level was determined in forested and cutover soils of central and northern Wisconsin by observations of open wells during the frost-free periods. In nonpodzolic, coarse, sandy soils, ground water possesses considerable mobility, and forest cover caused a lowering of the water level not exceeding 9 inches in strongly podzolized, morainic soils, however, clear cutting of aspen stands produced an average rise of 14 inches and converted a reasonably well-drained soil into a semiswamp.

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Ground Water

PUMPING FROM WELLS ON THE FLOOR OF THE SEVIER DESERT, UTAH

By W. B. Nelson and H. E. Thomas. Amer. Geophys. Union Trans. 34: 74-84. 1953.

Data collected at the Topaz Relocation Center provide an excellent record of the development and subsequent disappearance of a cone of depression caused by pumping. This Center occupied temporarily an area of natural ground water discharge on the floor of the Sevier Desert in west-central Utah. Water for a population of 6500 was pumped from artesian wells which tapped aquifers of sand. Overlying these sandbeds are lake-bed sediments too permeable to yield water to wells, but apparently permeable enough to permit slow upward movement of water from the artesian aquifers. The water table is near the surface, and there is a natural discharge by evapotranspiration, accumulation of "alkali" in the soil, and a need for drainage of irrigated lands. The wells were abandoned when the Relocation Center was closed, apparently because these handicaps were so great that the ground water could not be used profitably for irrigation.

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THE EFFECT OF GROUND WATER-LEVEL ON THE PERFORMANCE AND YIELD OF SOME COMMON CROPS

By H. H. Nicholson and D. H. Firth. Jour. Agr. Sci. 43: 95-104. 1953.

Observations made on growing a series of crops in rotation over a range of static ground water-levels in a Fen peat soil are described. The crops used show differences in reaction to ground water conditions, and the seasonal incidence of rain has an overriding influence on their performance. The effects of ground water-level may operate directly on the growth and development of a crop, or may influence it indirectly through a variety of factors.

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OXIDATION-REDUCTION POTENTIAL AND SPECIFIC CONDUCTANCE OF GROUND WATER: THEIR INFLUENCE ON NATURAL FOREST DISTRIBUTION

By R. S. Pierce. Soil Sci. Soc. Amer. Proc. 17: 61-65. 1953.

The mineral content of ground water and its degree of stagnation are closely correlated with specific conductance and oxidation-reduction potential. To eliminate several handicaps involved in sampling and transportation of uncontaminated water samples, a method of direct electrometric analysis of ground water in situ was devised. Electrometric analyses were supplemented by determinations of the content of dissolved oxygen and total hardness. Analyses of ground water in lowland and peat soils of Wisconsin and Ontario have shown definite relationships between the properties of ground water and the natural distribution of forest stands.

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Sedimentation

FLOCCULENT STRUCTURE OF SEDIMENT SUSPENDED IN LAKE MEAD

By I. Sherman. Amer. Geophys. Union Trans. 34: 394-406. 1953.

More than half the weight and volume of sediment deposits in Lake Mead are fine textured, being primarily silt and clay. These deposits have surprisingly low specific weights, much lower than can be accounted for by systems of particle packing or by particle size alone. This report interprets the low specific weight of deposited sediment in terms of behavior and structure in suspension prior to deposition.

In suspension, the sediment particles do not act as individuals, but, because of the salinity of the water, are grouped in floccules. These floccules are highly porous, their porosity being a function of component particle sizes. It is because of the porosity of the suspended floccules that the resulting deposits have such low specific weights.

The pores in the suspended floccules are so small, and their permeabilities so low, that water in them can be considered trapped there as an integral part of the floccules. The effective density of a suspended floccule is therefore not 2.65 gm/cm^3 but some lower figure which appears to approximate 1.4 gm/cm^3 for sediment with a median particle diameter of one micron.

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TRAP EFFICIENCY OF RESERVOIRS

By G. M. Brune. Amer. Geophys. Union Trans. 34: 407-418. 1953.

Forty-four records of reservoir trap efficiency and the factors affecting trap efficiency are analyzed. The capacity-inflow (C/I) ratio is found to offer a much closer correlation with trap effiency than the capacity-watershed (C/W) ratio heretofore widely used. It appears likely from the cases studied that accurate timing of venting or sluicing operations to intercept gravity underflows can treble or quadruple the amount of sediment discharged from a reservoir. Desilting basins, because of their shape and method of operation may have trap efficiencies about 90% even with very low C/I ratios.

Semi-dry reservoirs with high C/I ratios may have trap efficiencies as low as 60%. Truly "dry" reservoirs probably have trap efficiencies in the 10 to 40% range, depending upon C/I ratio.

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SEDIMENT PROBLEMS IN LAKE MEAD AND DOWNSTREAM ON THE COLORADO RIVER

By C. P. Vetter. Amer. Geophys. Union Trans. 34: 249-256. 1953.

This paper gives an outline of the effects on the regimen of the river which were produced by the construction of the Hoover Dam on the Colorado. The effects fall in two categories: (1) The many phenomena that occur in an arid region when a great lake, more than a hundred miles long, and in places more than 600 feet deep, storing almost 2-1/2 average years' yield of the watershed, is created within a few years. The phenomena have to do with the distribution within the volume of the reservoir of the great incoming sediment load, with the travel of the incoming water through the stored volume of the stratification of the lake due to temperature and salinity, and, finally, to the seismic effect of the great accumulated weight. (2) The phenomena occurring on the river above, and particularly below, the dam when the river bed adjusted to a sediment-laden stream is suddenly forced to accommodate a flow of clear water, and when the yearly fluctuations of flow from flood to drouth are changed to an almost steady discharge.

The sedimentation survey of Lake Mead, formed by Hoover Dam undertaken in 1947-50, yielded, for the first time, precise data on the travel and deposition of sediment, on the circulation of the water within the lake, and on the general subsidence of the Earth's crust caused by the weight of the water. The paper gives an outline of the main results of the survey pending publication of a complete report.

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Hydraulics--Structures

ARTIFICIAL ROUGHNESS STANDARD FOR OPEN CHANNELS

By A. R. Robinson and M. L. Albertson. Amer. Geophys. Union Trans. 33: 881-888. 1952.

In the formulas in present use the resistence coefficient has been considered constant for a particular type of material in a particular state of upkeep. The resistance coefficient, however, is not a constant for a given channel but varies with both velocity and depth. From the nature of these formulas in present use, it may be seen that the variable influence of viscosity is not taken into consideration. Because of the need for more accurately determining the discharges in open channels a standard of roughness for open channels such as that which exists for pipes is desirable. This study was conducted for the purpose of determining whether an artificial roughness standard could be established for a channel with a boundary so rough that the viscous effects were negligible. The equation $C=26.65 \log_{10} (1.891 d/a)$ was established and is applicable over at least a fourfold variation in d/a and nearly a twofold variation in the resistance coefficient.

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COMPLICATED WELL PROBLEMS SOLVED BY THE MEMBRANE ANALOGY

By V. E. Hansen. Amer. Geophys. Union Trans. 33: 912-916. 1952

The two general equations for well flow, whether confined or unconfined, are outlined for steady-state conditions. The membrane theory is presented and the experimental equipment and results outlined for the case of a well discharging from storage in an aquifer bounded by a circular line source. It is shown that with certain limitations the membrane analogy will yield solutions for steady-state problems of ground-water flow with complicated boundary or well-distribution geometry, whether flow is confined or unconfined. The principles of model design necessary to duplicate the sample boundary conditions are presented.

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SOIL AND WATER MANAGEMENT

General

INFLUENCE OF SOIL AGGREGATION ON PLANT GROWTH

By J. Hagin. Soil Sci. 74: 471-478. 1952.

Variously aggregated soils produced highly significant differences in wheat yields. The coarsely aggregated soil produced much better plant growth than finely aggregated soil. It was noted that structural changes of the soil may considerably influence results of fertilizer tests.

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SOIL CONSERVATION MANAGEMENT SYSTEM FOR BEEF PRODUCTION IN THE BLACKLANDS OF TEXAS

By O. J. Tippit and J. H. Jones. Tex. Agr. Expt. Sta. Misc. Pub. 90. 1953.

Experimental results on Houston Black and Austin clay soils at Temple during the past 8 years have shown the value of erosion-resisting and soil-improving crops when measured in per-acre gain of beef steers. Information obtained from a number of practical field-scale grazing trials with grasses, small grains, and legumes is given in this publication.

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SOIL PRIMING IN RELATION TO SNOW SURVEYS AND FLOOD REGULATION

By M. W. Nelson, H. G. Wilm, and R. A. Work. Amer. Geophys. Union Trans. 34: 240-248. 1953.

In earlier analyses of techniques for water forecasting in the Columbia River Basin, both water yields and flood discharges were found to be highly correlated with the water content of snow as determined by snow surveys, and with the amount of precipitation which occurred during the spring. Studies described in this paper demonstrate the additional correlation obtained by including data on autumn precipitation in the forecast analyses. Recorded for the autumn preceding each spring flood, these data express the degree of "soil priming" in the Basin--the extent to which autumn deficits in soil moisture are replenished by precipitation before the snow-pack accumulates each winter. Data on this variable were included in a linear multiple regression equation, with snow water content and spring precipitation as the other independent variables. As compared to previous analyses, the inclusion of the soil-priming variable made a 40% improvement in the standard error of the forecasts, made on April 1 of each year. Smaller improvements in precision were observed for later forecasts, made on May 1 and May 15.

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Soil Fertility

DEVELOPMENT OF THE ROOT-KNOT NEMATODE, *MELOIDOGYNE INCOGNITA*, AS AFFECTED BY POTASSIUM NUTRITION OF THE HOST

By B. A. Oteifa. Phytopathology. 43: 171-174. 1953.

In experiments demonstrating the effect of plant host nutrition on the development of a root-knot nematode *Meloidogyne incognita,* 3 potassium nutrient levels representing deficient, optimum, and excessive concentrations were employed. Only minor differences in the development of the nematodes in the 3 treatments were noted between entry of the larvae into roots and development of fully grown females. Potassium nutrition had a considerable effect, however, on the length of time between the development of the female to maturity and egg deposition. First egg production was observed after 40, 24, and 16 days from the time of inoculation, in the deficient, optimum, and excessive potassium series respectively. The findings indicate that potassium nutrition is of considerable importance in determining the development time of root-knot nematodes.

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PHOSPHORUS AND PHOTOSYNTHESIS: I. DIFFERENCES IN LIGHT AND DARK INCORPORATION OF RADIOPHOSPHATE

By M. Goodman, D. F. Bradley, and M. Calvin. Amer. Chem. Soc. Jour. 75: 1962-1967. 1953.

The distribution of radioactivity in metabolites of photosynthetic algae exposed to $KH_2P^{32}O_4$ in light and dark was determined by paper chromatography and radioautography. The large relative increase of adenosine triphosphate in the dark, and of 3-phosphoglycinc acid in the light is discussed in relation to the mechanisms of phosphorylation of photosynthetic intermediates. Evidence is given indicating that adenosine triphosphate is the first insoluble product formed from inorganic phosphate, and that uridine diphosphate glucose and adenosine diphosphate are active in phosphate metabolism.

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TRANSITION OF PHOSPHITE TO PHOSPHATE IN SOILS

By F. Adams and J. P. Conrad. Soil Sci. 75: 361-371. 1953.

The nature of oxidation of phosphite added to the soil was investigated. Both chemicals and biological assays were used to determine the amount of phosphite oxidation in the soil. The oxidation proceeded only when microbial activity was not restricted by the presence of toluene.

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AVAILABILITY OF FIXED AMMONIUM IN SOILS CONTAINING DIFFERENT CLAY MINERALS

By F. E. Allison, J. H. Doetsch, and E. M. Roller. Soil Sci. 75: 373-381. 1953.

Ammonium fixation studies with five subsoils containing a high percentage of single clay mineral and one surface soil are reported. It was shown that soils in which the predominant clay mineral is vermiculite, illite, or montmorillonite have the capacity to fix considerable quantities of ammonium provided the fixing capacity has not already been satisfied.

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ACID-SOIL INFERTILITY AS RELATED TO SOIL-SOLUTION AND SOLID-PHASE EFFECTS

By J. Vlamis. Soil Sci. 75: 383-394. 1953.

Lettuce and barley were grown in a column of pots with a soil solution circulating through a sand and a sand-plus-soil phase. Plants grew poorly in the acid soil columns--both in the sand pot and in the one containing soil plus sand. Where the soil had been limed, plants grew equally well in the two phases.

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FIELD CORRECTION OF CALCIUM DEFICIENCY ON A SERPENTINE SOIL

By W. E. Martin, J. Vlamis, and N. W. Stice. Agron. Jour. 45: 204-208. 1953.

Field plots were set up in 1947 on a serpentine soil to test the effectiveness of massive gypsum applications as a means of correcting a calcium deficiency. Rates of 1, 2, 4, and 8 tons of gypsum were applied broadcast and disked into the soil. Yields of hay have been measured for five successive seasons. They revealed no effect of treatment the first season but there was significant stimulation of yields throughout the following 4 years, particularly where the higher rates of gypsum had been applied. Yields of hay have been related directly to the calcium saturation of the soil and have been further increased by the addition of nitrogen where it was applied to stimulate the growth of barley and oats. A substantial build-up in replaceable calcium took place in the surface 6 inches where 8 tons of gypsum had originally been applied, but the second, and third-foot layers were unaffected.

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RESPONSE OF EVERGREEN SWEET CLOVER AND COTTON TO PHOSPHORUS APPLICATIONS IN HOUSTON BLACK CLAY

By L. C. Kapp, R. J. Hervey, J. R. Johnston, and J. C. Smith. Soil Sci. 75: 109-118. 1953.

Field experiments with radioactive phosphate were conducted with Empire Cotton, Evergreen sweet clover grown on calcareous Houston clay to determine the effect of phosphate, placement of phosphate, and crop species on yields and uptake of P derived from soil and fertilizer. Wide differences were found in the response of cotton and sweet clover to applied phosphate.

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NITROGEN FERTILIZATION AS RELATED TO THE AVAILABILITY OF PHOSPHORUS IN CERTAIN CALIFORNIA SOILS

By G. A. Lorenz and C. M. Johnson. Soil Sci. 75: 119-129. 1953.

The form of nitrogen fertilization made very large differences in crop yields on certain light, slightly alkaline soils.

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DEEP-PLACED ANHYDROUS AMMONIA DOES WELL UNDER DRY CONDITIONS

By W. B. Andrews. Crops and Soils 5: 24. 1953

In dry years, anhydrous ammonia applied 4 to 6 inches deep has been much superior to surface-applied ammonium nitrate, when used as a side dressing.

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SODIUM AND POTASSIUM REQUIREMENTS OF PANGOLA AND OTHER PASTURE GRASSES

By N. Gammon, Jr., Soil Sci. 76: 81-90. 1953

This study was designed to determine to what extent sodium could be substituted for potassium with certain pasture plants. It was found that sodium may be substituted for approximately two-thirds of the potassium requirement of Pangola grass without causing any appreciable reduction in growth.

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RESPONSE OF OATS TO NA AND K ON NORFOLK SANDY LOAM AT TWO RESIDUAL K LEVELS

By R. L. Wehunt and W. O. Collins. Soil Sci. 76: 91-96. 1953.

This study was designed to investigate the effects of Na and K applied to Norfolk sandy loam at two residual K levels on the yield of Na and K contents of oats.

Marked oat yield responses were obtained with both Na and K. A significantly higher yield was obtained on the high residual K plots than on the low. Additions of Na to the soil markedly increased the Na content of the oat forage. The high residual K level of the soil depressed the Na uptake of oat forage. Applications of K to the soil greatly increased the K content of oat forage. More K was found in the oat forage from the high residual K plots than from the low. Increases in the exchangeable Na of the topsoil due to Na additions were small but significant.

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INFLUENCE OF SODIUM ON YIELD AND QUALITY OF COTTON LINT AND SEED

By J. D. Lancaster, W. B. Andrews, and U. S. Jones. Soil Sci. 76: 29-40. 1953.

In 25 field experiments, response of cotton to sodium at different levels of potassium fertilization was measured. Response to potassium was obtained in only five experiments, and to sodium in only four. The largest increase in yield attributed to sodium was obtained on the most potassium-deficient soil and, in this instance, little, if any, response to sodium was obtained when sufficient potassium was added.

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COMMERCIAL FERTILIZERS, CONSUMPTION IN THE UNITED STATES, 1951-52

By W. Scholl and H. M. Wallace. U. S. Dept. Agr. Bur. Plant Indus. Soil and Agr. Engin. 1953. (Multilith).

This 13th annual survey shows consumption of fertilizers in the United States, including the Territories (Hawaii, Puerto Rico, Alaska) amounted to 22,432,418 tons during the year ended June 30, 1952. Of this total, mixed fertilizers, 15,086,349 tons, constituted 67.3%, materials containing one or more primary plant nutrients (N, P_2O_5, K_2O) 6,561,019 tons (29.2%), and secondary and minor element materials 785,050 tons (3.5%). Consumption of all fertilizers was 1,441,024 tons or 6.9% greater than the revised total (20,991,394 tons) for 1950-51. Increases in consumption of these classes were for mixed fertilizers 1,107,967 tons (7.9%), materials containing primary nutrient 194,276 tons (3.1%), and secondary and minor element materials 138,781 tons (21.5%) greater than their respective consumption in 1950-51. Fertilizers consumed in 1951-52 contained a total of 5,205,623 tons of primary plant nutrients consisting of nitrogen 1,424,780 tons, available P_2O_5 2,199,376 tons, and K_2O 1,581,467 tons. These quantities represented a net increase for nitrogen of 187,803 tons (15.2%), for available P_2O_5 89,476 tons (4.2%), and for K_2O 201,654 tons (14.6%).over 1950-51. The total content of P_2O_5 in all fertilizers consumed was 2,678,070 tons. The weighted average total primary nutrient content in all commercial mixtures consumed in 1951-52 was 24.86% as compared with 24.19% in 1950-51.

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AMMONIUM FIXATION AND AVAILABILITY IN VERMICULITE

By F. E. Allison, E. M. Roller, and J. H. Doetsch. Soil Sci. 75: 173-180. 1953.

The purposes of this study were: (a) to obtain information on the capacity of vermiculite to fix ammonium under various conditions, particularly those in soils, and (b) to determine the percentage of fixed ammonium that is readily released by nitrifying bacteria and also by chemical agents. Vermiculites were found to have the capacity to absorb a large quantity of ammonium that is not readily leached out. The ammonium in some of the samples of natural vermiculite was nearly as available to nitrifying bacteria as was that in ammonium salts.

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FERTILITY STUDIES ON SOIL TYPES: II. THE PHYSICAL AND CHEMICAL COMPOSITION OF SOILS FROM CARLETON AND GREENVILLE COUNTIES IN ONTARIO

By H. J. Atkinson, G. R. Giles, and A. J. MacLean. Canad. Jour. Agri. Sci. 33: 116-124. 1953.

The results of analysis of 90 surface soil samples from 10 major soil types of Carleton and Greenville counties in Ontario are presented. The samples varied in texture from sands to clays and in reaction from moderately acid to moderately alkaline. Except for the soils of light texture, most of the samples were quite well supplied with organic matter and nitrogen. Values for exchangeable calcium, magnesium and potassium are given. Results for the trace elements boron, manganese, cobalt and copper showed the variation to be found between and within soil types. A high positive correlation was found between clay and cobalt content and between clay and copper content.

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MAGNESIC MINERALS AND SOILS--A 4-YEAR LYSIMETER STUDY OF THEIR INTERREACTIVITIES

By W. H. MacIntire, W. M. Shaw, and J. B. Young. Jour. Agr. and Food Chem. 1: 56-61. 1953.

A 4-year lysimeter study was prompted by the possibility that directly incorporated serpentine, and olivine, might be an economic source of magnesium in forms available to plants. Through analyses of rain-water leachings of bicarbonate, magnesium, calcium, potassium, nitrate nitrogen, and sulfate sulfur from 1000-pound-per-acre inputs of magnesium oxide equivalence, it was established that the -100+200-mesh separates underwent slight decompositions, the -325 mesh materials suffered somewhat greater decompositions, and both silicates retarded the dissolution of the calcium and potassium of the native complexes. In contrast to their reactivities when mixed in superphosphate, the silicates proved decidely less reactive than either magnesite or dolomite in the soils. Inputs of magnesium caused decreases in outgo of calcium.

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A STUDY OF THE RELATIONSHIP BETWEEN CHEMICALLY AVAILABLE PHOSPHORUS AND PLANT-GROWTH RESPONSE ON SEVERAL MICHIGAN SOILS

By F. W. Smith and R. L. Cook. Soil Sci. Soc. Amer. Proc. 17: 26-30. 1953.

The objective of this investigation was to correlate plant growth response with chemically measured available phosphorus in the soil. Eight chemical methods of extracting the available phosphorus in the soil samples were utilized. An attempt was made to correlate growth response of wheat with chemically measured available phosphorus. The principles of Mitscherlich as modified by Bray were employed. In general, the amount of chemically measured phosphorus as extracted by the Spurway active extracting solution was quite low in comparison to that extracted by the other methods. Increasing the time of shaking during extraction or increasing the ratio of extracting solution to soil did not improve the Spurway active test.

The use of any of the methods of Bray provided a considerably clearer picture of phosphorus availability because the inclusion of fluoride in the extracting solution enabled the adsorbed phosphorus in the soil to be removed.

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SERPENTINE-FUSED PHOSPHATE--CRITIC SOLUBILITY AND GLASS CONTENT CORRELATION

By Tah-ho Huang. Jour. Agr. and Food Chem. 1: 62-67. 1953.

Olivine and serpentine have been used successfully in plant scale operations for solubilizing the phosphorus pentoxide in phosphate rock. Among the properties of the new phosphate material so far reported, most interesting is its amorphous nature which is closely related to its chemical as well as agronomic availability.

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AVAILABILITY OF RESIDUAL PHOSPHORUS OF SUPERPHOSPHATE AND ROCK PHOSPHATE DETERMINED BY PHOSPHORUS IN CROPS FROM RADIOACTIVE SUPERPHOSPHATES

By J. R. Neller and H. W. Lundy. Soil Sci. 74: 409-415. 1952.

The availability of the phosphorus of pretreatments of superphosphate and of rock phosphates disked into the surface 4 inches of Marlboro fine sandy loam was determined by addition of radioactive superphosphate. More than 40% of the phosphorus in a crop of oats was obtained from the residual phosphorus of superphosphate applied at 100 pounds P_2O_5 per acre. Pretreatments at 300 pounds per acre resulted in more than 60% uptake of of phosphorus from residual phosphates.

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PENETRATION AND LOSS OF HEAVY APPLICATIONS OF BORAX IN THE FLORIDA MINERAL SOILS

By H. W. Winsor. Soil Sci. 74: 459-466. 1952.

This study investigated the rate of penetration and loss of heavy applications of borax in two Florida soils. Notable penetrations into the clay subsoil of Arredondo loamy fine sand occurred. Borax in herbicidal quantities did not remain in the topsoil of either Lakeland fine sand or Arredondo loamy fine sand for as long as 4 months from time of application.

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THE SANDY SOILS OF FLORIDA NEED POTASH FOR PASTURES

By N. Gammon, Jr., and W. G. Blue. Better Crops with Plant Food. 37: 25-26, 40-41. 1953.

In considering the potash requirements for pastures on the sandy soils of Florida, attention is called to wide variations in the optimum potassium content of various pasture plants and to the differences, between clovers and grasses, in minimum soil requirements for optimum growth. Current fertilizer practices do not supply sufficient potash for optimum growth of most pasture plants. Specific fertilizer recommendations are made.

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THE NUTRITION OF MAIZE IN SAND CULTURE: I. THE BALANCE OF NUTRITION OF NITROGEN AND PHOPHORUS

By J. Glover. Jour. Agr. Sci. 43: 154-159. 1953.

Experiments with the nutrition of corn in sand culture showed that if all other nutrients are supplied in adequate amounts for good growth and supplies of potassium range between 5 and 45 p.p.m. of solution, then the level of balance of the nitrogen and phosphorus supplies determines the size, yield, and earliness of flowering of the plant.

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THE NUTRITION OF MAIZE IN SAND CULTURE: II. THE UPTAKE OF NITROGEN AND PHOSPHORUS AND ITS RELEVANCE TO PLANT ANALYSIS

By J. Glover. Jour. Agr. Sci. 43: 160-165. 1953.

Studies of the uptake of nitrogen and phosphorus by corn grown in sand culture show that in general the consumption of both increases as the plant grows in size up to the stage of tasseling and silking. Thereafter, the consumption of nitrogen decreases during the setting and ripening of grain and quickly falls off to a very low level before harvest. The consumption of phosphorus, on the other hand, continues at a high level right through to harvest. The uptake of nitrogen depended not only on the level of supply of nitrogen but also on the level of supply of phosphorus. That is, it depended on the balance of the nitrogen-phosphorus supplies. On the other hand, the uptake of phosphorus depended only on the level of supply of that element and not on the level of supply of nitrogen within wide limits.

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SUPERPHOSPHATE MANUFACTURE--PARTIAL REPLACEMENT OF SULFURIC ACID WITH NITRIC ACID

By D. McKnight, J. F. Anderson, Jr., M. M. Striplin, Jr., and T. P. Hignett. Jour. Agr. and Food Chem. 1: 162-166. 1953.

The object of this work was to develop a process in which nitric acid would replace some of the sulfuric acid used in making superphosphate without substantial alteration of the manufacturing equipment. Expected advantages of the process were lower cost of fertilizer manufacture and saving of scarce sulfuric acid. Promising results were obtained in a pilot plant using either a batch, pan-type mixer or a continuous, funnel-type mixer discharging into a box den. When phosphate rock was acidulated with mixtures of nitric and sulfuric acid containing about 30% water, the product solidified, and after 10 to 30 minutes, it was a solid resembling fresh superphosphate. About half the sulfuric acid required to make ordinary superphosphate was replaced with nitric acid. Two days' curing time was required to develop the maximal phosphorus pentoxide availability of about 98%. After curing, the product was ammoniated in a drum mixer with gaseous, anhydrous ammonia; a typical product, after ammoniation, contained about 6% nitrogen and 18% available phosphorus pentoxide.

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INTERACTION OF SODIUM AND POTASSIUM ON YIELD AND CATION COMPOSITION OF SELECTED CROPS

By W. E. Larson and W. H. Pierre. Soil Sci. 76: 51-64. 1953.

The objectives of this investigation were: first, to determine the comparative effects of soil additions of Na and K salts when used in equivalent amounts alone and in combination, on the yield and cation composition of four crops of normally different response to Na; second, to study the nature and degree of cation replacement in these crops in relation to their differential response to Na and K fertilization.

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EFFECTS OF APPLICATIONS OF SODIUM IN FERTILIZER ON YIELDS AND COMPOSITION OF THE COTTON PLANT

By H. P. Cooper, W. R. Paden, and M. M. Phillippe. Soil Sci. 76: 16-28. 1953.

The yield and plant composition data reported in this paper, indicate, at the rates applied, there is a supplementary relation between potassium and sodium in the fertilizer and the yield of seed cotton. There is apparently a reciprocal relationship between the calcium and sodium in the plant. The responses reported are assumed to be associated in some way with the solubility and availability of carbonate compounds effective in the photosynthesis of the highly carbonaceous cotton fibers.

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Structure Control

STATUS REPORT ON SOIL CONDITIONING CHEMICALS I

By W. P. Martin. Soil Sci. Soc. Amer. Proc. 17: 1-9. 1953.

Because of the short time the synthetic soil conditioners have been available for test, it is not possible to draw other than tentative conclusions. However, it appears fairly evident that they can effect marked improvement in the physical state of soils if properly applied. Rates of application of the order of 0.05% are such that at current prices the usefulness of these products in agriculture is likely to be limited to surface application with high value crops or for special purposes.

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SOIL STRUCTURAL STABILITY OF BROOKSTON CLAY AS A FACTOR IN SUGAR BEET YIELDS

By P. J. Zwerman, J. B. Page. and R. E. Yoder. Soil Sci. Soc. Amer. Proc. 17: 159-164. 1953.

The purpose of this research was to determine the influence of the structural stability of soil upon the yield of sugar beets. There were no differences in yield associated with soil structural differences except in the case of 4 inches of rain per week. This difference was significant. Differences in yield as affected by rainfall were significant for all comparisons except "ideal" rain and 1942 rain.

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IMPROVING LAND CONDITIONS FOR CONSERVATION AND PRODUCTION WITH CHEMICAL SOIL CONDITIONERS

By R. W. Pearson and V. C. Jamison. Jour. Soil and Water Conserv. 8: 130-135. 1953.

On the basis of rather short-term field and laboratory tests it has been definitely shown that certain of the proposed soil conditioners can produce marked improvement in the physical condition of fine textured compact soil when properly applied at sufficiently high rates. To date, the polyvinylites and cellulose gums appear to be most effective on a wide variety of soils.

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TRAFFIC SOLES

By G. R. Free. Agr. Engin. 34: 528-531. 1953.

The compactness and permeability of intensively cropped soil on Long Island within and below plow depth was shown to be determined by the traffic pattern imposed on the soil during the preceding three years. It was possible to detect and measure the compaction pattern even though all evidence of row location had been removed by leveling and planting of winter cover crop six months before. A traffic sole or compact layer had been found where intensive cropping had been followed for several years. There was no such layer under either woods or range land.

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AVAILABLE MOISTURE CAPACITIES OF SOILS AS AFFECTED BY ADDITIONS OF POLYELECTROLYTE SOIL CONDITIONERS

By B. B. Peters, R. M. Hagan, and G. B. Bodman. Soil Sci. 75: 467-471. 1953.

Additions of as much as 0.2% by weight of CRD-186 and CRD-189 to soils varying in texture from sandy loam to clay did not increase their moisture equivalents as determined with the standard centrifuge. In fact, where wetting and drying cycles favored maximum aggregation of the treated soils, the moisture equivalents tended to be lower than those of the untreated soils. Adding large amounts of these soil conditioners at rates as high as 0.4% by weight caused some increases in moisture equivalents, particularly within the coarse-textured soils. The permanent wilting percentages, as determined by sunflowers were not affected by additions of 0.1% by weight of CRD-189. Application of synthetic polyelectrolyte soil conditioners does not appear to offer a practical means of increasing the amount of available moisture held by a unit quantity of soil.

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EFFECT OF SOIL-AGGREGATING CHEMICALS ON SOILS

By G. S. Taylor and W. P. Martin. Agr. Engin. 34: 550-554. 1953.

The effect of several synthetic soil-aggregating chemicals on the physical properties of fine-textured Miami, Crosby, Brookston, and Paulding soils were studied. Application rates varying from 0.05 to 0.15 percent were applied in both powder and liquid forms. Pronounced changes in soil aggregation and such related characteristics as pore size distribution, water infiltration, and hydraulic conductivity were obtained. Large aggregates (>2 mm. in diameter) were commonly produced and these aggregates proved to be water-stable and rather resistant to microbial decomposition.

The effect of soil-aggregating chemicals on the growth of many crops was tested in statistically controlled field experiments. Not all crops responded to treatment, although appreciable increases in the yield of field tomatoes, corn, oats, and carrots were obtained. Field tests showed these chemicals to be effective in preventing soil crusting and reducing runoff and erosion.

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FACTORS THAT INFLUENCE CLOD STRUCTURE AND ERODIBILITY OF SOIL BY WIND: I. SOIL TEXTURE

By W. S. Chepil. Soil Sci. 75: 473-483. 1953.

Soil texture had a profound influence on erodibility by wind. The coarsest and finest textured soils were more erodible than the medium textured soils because they had a less developed clod structure. The coarse textured soils lacked sufficient cementing material (silt and clay) to bind the individual sand grains together; the fine textured soils, on the other hand, had too much clay, which, under action of the weather, caused the soil clods to disintegrate into a finely granulated, erodible condition. The most cloddy and the least erodible soils, other factors being equal, contained about 27% of clay and the greatest possible proportion of silt, and had a moisture equivalent of about 23. Clay in amounts equal to 15% of the weight of the soil was extremely important in increasing cloddiness and in reducing erodibility by wind. Amounts considerably greater than 27% were detrimental. Notably in clay and silty clay soils, the clay fraction was a predominant factor in decreasing cloddiness and increasing erodibility although silt was also an important factor, tending to increase cloddiness and to reduce erodibility.

Erodibility varied directly with percentage of fraction less than 0.42 mm. or less than 0.84 mm. in diameter and with proportions of sand, silt, and clay in the soil. Simple algebraic expressions were found to denote these relationships.

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Drainage

CORRELATION BETWEEN PIPE FLOW AND UNIFORM FLOW IN A TRIANGULAR OPEN CHANNEL

By W. M. Owen. Amer. Geophys. Union Trans. 34: 213-219. 1953.

A dimensionless open-channel resistance diagram, based on an existing diagram by Moody for circular pipes, is presented. Data were taken on a 90-degree triangular flume in smooth and roughened condition from actual open-channel flow data. A comparison of the two diagrams presented is made by computing average velocities for several hypothetical channels. Correlation was found to be fair.

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AN ELECTRICAL RESISTANCE NETWORK FOR SOLVING DRAINAGE PROBLEMS

By J. N. Luthin. Soil Sci. 75: 259-274. 1953.

A resistance network is described which employs variable resistors or rheostats. The use of rheostats enables quick solution of difficult problems involving stratified soil or nonhomogeneous soils. This resistance network is capable of solving Laplac's equation and hence is of use in analyzing drainage problems.

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Irrigation

IRRIGATION OF SOILS AND SOIL COLLOIDS: IV. HUMIC AND HYMATOMELANIC ACIDS AND THEIR SALTS

By C. E. Marshall and N. Patnaik. Soil Sci. 75: 153-165. 1953.

The results of this study indicate that cations are held, on the whole, less firmly by humic fractions than by clay minerals. The cationbinding energies change relatively little near the inflection points on the pH curves. In fractions from peat, sodium was held more firmly than potassium, and magnesium more firmly than calcium. Fractions from a chernozem soil showed much smaller differences.

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SPRINKLER VS. GRAVITY IRRIGATION--A BASIS FOR CHOICE OF THE BEST SYSTEM

By F. B. Hamilton and J. F. Schrunk. Agr. Engin. 34: 246-250. 1953.

The authors discuss a number of factors comprising the basis for choosing between sprinkler and gravity irrigation. These include initial investment, operating and maintenance costs, irrigation efficiency, and personal traits of the irrigator.

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THE DISPOSAL OF INDUSTRIAL EFFLUENT BY WOODS IRRIGATION

By J. R. Mather. Amer. Geophys. Union Trans. 34: 227-239. 1953.

A method for the disposal of industrially polluted effluent by woods irrigation is described, and the results of hydrologic investigations during the first year of operation are evaluated. It was found that the spraying of 400 to 600 inches depth of water on the woods area did not harm the vegetation, clog the soil, or result in saturation of the area. A maximum of about 50 million gallons of water were removed from the selected 180-acre disposal area weekly by ground-water discharge and evapotranspiration. Analyses of well water from the woods area showed no indication of pollution as a result of the disposal operation.

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ESTIMATED FREQUENCIES AND EXTREME VALUES OF SNOW-PACK WATER EQUIVALENT AT MAJOR CITIES IN THE UNITED STATES

By W. T. Wilson and R. D. Tarble. Amer. Geophys. Union Trans. 33: 871-880. 1952.

The limited number of direct observations of weight of snow pack, particularly in populated localities, has made it necessary to study relations between observed or estimated weight of snow pack and other parameters. Fair relations have been established at stations having suitable data, and have been generalized on the basis of the good areal distribution of two parameters that are available in convenient published form: depth of snow on the ground and accumulated seasonal snowfall. The results seem to be consistent with the limited snow-survey data available in the area of interest and with other sources.

The water equivalent of accumulated seasonal snow pack that may be equaled or exceeded once in 50 years (about the maximum of record) is about 7% of the maximum seasonal snowfall and about 20% of the maximum observed snow depth in inches. The values of water equivalent to be equaled or exceeded one year in ten are 75% and one year in two are about 50%, of the maximum of record.

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LINING IRRIGATION CANALS TO SAVE WATER AND LAND

By C. W. Lauritzen. Agr. Engin. 34: 407-408, 410. 1953.

Lining irrigation canals is the simplest and most effective method of saving both water and land in irrigated areas. Although costly, it is likely to be cheaper than developing additional water by increased storage. At the same time, it takes much of the burden from drains in areas affected by high water tables fed by seepage and deep percolation from excess irrigation. The most important types of lining are discussed.

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COMPARISON OF TWO METHODS OF ESTIMATING CONSUMPTIVE USE OF WATER

By B. R. Tomlinson. Agr. Engin. 34: 459-464. 1953.

This paper compares the Lowry-Johnson and Blaney-Criddle methods of estimating the consumptive use of water. The Blaney-Criddle method checked very closely the measured amount of water necessary to produce an average yield of mature hay. The annual consumptive-use value obtained by the Lowry-Johnson method was approximately twice the measured seasonal requirements.

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METHODS OF APPLYING AMMONIUM NITRATE FERTILIZER ON FIELD CORN, AND A STUDY OF THE MOVEMENT OF NH_4^+ AND NO_3 NITROGEN IN THE SOIL UNDER IRRIGATION

By C. E. Nelson. Agron. Jour. 45: 154-157. 1953.

A comparison of different methods and time of application of ammonium nitrate to field corn was made. This study was carried out on virgin Ephrata fine sandy loam soil, 2-feet deep, and underlain with coarse gravel and cobbles. Yield differences between treatments were not significant. It was concluded from field corn experiments and the study of the NO_3^-N and NH_4^+ movement in the soil that, with normal field management using 120 lbs. of nitrogen per acre, there was no advantage in side-placing, side-dressing, or split applications over the broadcast and plowing method in fertilizing with ammonium nitrate on this particular soil.

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IRRIGATION PAYS AND PAYS AND - - -

By C. H. M. van Bavel and T. V. Wilson. N. C. Agr. Expt. Sta. Res. and Farming: 10: 6-7. 1953.

Two years research at the McCullers and Oxford stations show that tobacco irrigation can be a paying thing in most years. A gross increase of about $350 per acre was made possible by irrigation at Oxford--enough to enable the farmer to wind up the season with a paid-for irrigation system and more money in the bank than if he didn't irrigate.

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PRESSURE CONTROL ON INDIVIDUAL SPRINKLERS

By C. N. Johnson. Agr. Engin. 34: 332-333. 1953.

The author describes a device designed to control the pressures for or in sprinklers. It is based on the principle of using fluctuations from the desired working pressure as a means of energizing a value, so that when the pressure at the nozzles falls below some fixed value, more water from the supply would be admitted, and vice versa.

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Cropping Systems

EFFECT OF LEGUMES, NITROGEN AND ROW SYSTEMS ON THE YIELD OF CORN ON MILLER CLAY SOIL, 1950-52

By H. E. Rea, F. A. Wolters and J. E. Roberts. Tex. Agr. Expt. Sta. Prog. Rpt. 1556. 1953.

This report gives the results for a 3-year period on two soil-improvement experiments on the Brazos River Valley Laboratory. Dixie Wonder peas as a winter green-manure crop between annual crops of corn increased the average yield of corn approximately 26% above that of continuous corn not preceded by a legume. The two-year rotation of corn with Melilotus indica was more effective in increasing the average yield of corn than fertilizing the corn with 60 pounds of nitrogen at planting time, when every row was planted to corn. The use of nitrogen in the rotation of corn with Melilotus indica did not increase the average corn yield.

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Residue Management

WHEAT STRAW--EFFECT OF STRAW AND CERTAIN SALTS ON SOIL REACTION

By J. V. Jordan, G. C. Lewis, and G. O. Baker. Jour. Agr. and Food Chem. 1: 236-239. 1953.

Wheat straw is a major crop residue, which is returned to the soil as a conservation practice.

It was considered of value to determine the effects of wheat straw upon soil reaction, alone and in the presence of certain salts commonly present in irrigated soils. The soils treated with nitrates of calcium and magnesium were only slightly more acid than soils treated with carbonates of calcium and magnesium, but after addition of straw soil acidity in the nitrate treated soil increased significantly over that in soils treated with carbonates, even though nitrogen levels in all treatments were equivalent. Sodium nitrate additions to soils containing calcium and magnesium nitrates exerted a significant effect in counteracting acidity between 2 and 3 months after the addition of straw. In the absence of other salts, sodium nitrate and straw resulted in greater soil acidity than did straw alone.

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MULCHES: AN IMPORTANT ITEM IN TROPICAL AGRICULTURE

By J. Vincente-Chandler. Jour. Soil and Water Conserv. 8: 136-139, 144. 1953.

Mulches will probably be more useful in the Tropics than they have been in temperate regions. In the Tropics where evaporation rates are high the year round, mulches can effectively reduce water losses of this type. By keeping the soil cool and moist, under the conditions of strong sunlight intensity that obtain in these areas, they favor seedling emergence and growth as well as root development and desirable microbial activity in the upper layers of soil. By protecting the soil from the impact of the torrential rains they help to keep it porous and reduce runoff and erosion. They also help control weeds and they can be used as a source of nitrogen fertilizer. The right kind of mulch, properly handled, can provide an economical and continuous supply of nitrogen for plant growth under conditions where most commercial fertilizers are quickly washed away or leached deep into the soil.

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MULCHES AND SOIL CONDITIONERS--CARBON AND NITROGEN IN FARM AND FOREST PRODUCTS

By W. B. Bollen. Jour. Agr. and Food Chem. 1: 379-381. 1953.

The nitrogen content of organic matter used as mulches or soil conditioners not only influences the rate and extent of their decomposition and humidification but also determines the available nitrogen released or required. Data on the carbon-nitrogen ratio of such materials are therefore essential for decomposition studies and for predicting additional nitrogen requirements for optimum microbial activity.

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MANURE MULCH HELPS CONTROL EROSION AND SAVES RAINFALL ON SLOPING LAND

By H. L. Borst. Ohio Agr. Expt. Sta. Farm and Home Res. 38: 50-51. 1953.

Four years of erosion measurements and seven years of yield tests have shown that topdressing corn with manure not only reduces erosion but may also increase yield. In this plan, manure which would ordinarily be plowed under for the corn crop was used as a top dressing after corn was planted. Surface protection of soil by manure mulch prevents rather than controls erosion. The function of mulches is to absorb the force of falling rain.

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INFLUENCE OF ORGANIC MULCHES ON REACTION AND EXCHANGEABLE CALCIUM CONTENT OF SOIL

By R. H. Goodman. Soil Sci. 75. 459-466. 1953.

After an extended period of mulching apple trees with hay and straw, a differential effect upon the orchard soil with respect to pH and exchangeable calcium was noted. Where hay mulches had been applied, a significant increase in the hydrogen-ion concentration was observed, especially in the surface 2 ins. of the profile. In addition, the application of hay mulches caused removal of rather large quantities of calcium from the upper 12 ins. of the soil. This effect was most pronounced in the 0-2-in. level.

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LEACHATES FROM DECOMPOSING LEAVES: I. SOME GENERAL CHARACTERISTICS

By L. E. Lutwick, B. B. Coldwell, and W. A. DeLong. Sci. Agr. 32: 603-613. 1952.

Chemical characteristics of leachates by exposure of leaves of beech, gray birch, sugar maple, and poplar on trays placed in the soil of the forest floor were investigated. It was found that such leachates tend to become less acidic as the time of exposure lengthens, but that this trend may be reversed during the interval between two growing seasons. Differences in the leachates from the leaves of the four trees tested are discussed.

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MULCH BALK!

By T. L. Copley and L. H. Forrest. N. C. Agr. Expt. Sta. Res. and Farming. 10 (3): 11. 1952.

Mulch balk method of cultivation applied to tobacco reduced runoff one-half and soil loss two-thirds over a three-year period. Rye turned under early had no effect in saving soil or water, or was even worse than the check plot, and soil loss was only one-fifth less when rye was turned late.

Summer erosion caused by hard thunder storm type of rains accounted for over 75% of the annual soil loss. Runoff and soil loss during late fall, winter and early spring were light, regardless of whether a cover crop was seeded or not.

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THE ANALYSIS OF THE RESULTS OF A ROTATION EXPERIMENT ON THE USE OF STRAW AND FERTILIZER

By H. D. Patterson. Jour. Agr. Sci. 43. 77-88. 1953.

An experiment designed to test different ways of using straw with fertilizers, and involving a 3-year crop rotation, was carried out between 1933 and 1951. The methods of analysis developed for this experiment are described and demonstrated by using yields of potatoes.

Treatment effects of interest are given by the mean yields over all years and the linear regressions of yield on time. These estimates are straight-forward but the evaluation of their errors is complicated by the existence of correlations due to the recurrence of treatments on the same plots. Further complications are introduced when, as frequently happens in long-term experiments, treatment effects show real variation from year to year. A method is given for estimating standard errors which includes a contribution from this variation.

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SAWDUST COMPOSTS: THEIR PREPARATION AND EFFECT ON PLANT GROWTH

By C. B. Davey. Soil Sci. Soc. Amer. Proc. 17: 59-60. 1953.

Greenhouse studies demonstrated that application of fresh sawdust at the rate of 40 cubic yards per acre strongly depressed the growth of deciduous and coniferous tree seedlings and green manure crops. Treatment of sawdust with anhydrous ammonia, phosphoric acid, and potassium sulfate failed to alleviate completely the adverse influence of sawdust and necessitated additional treatment of stock with nitrogen fertilizers. In order to decrease the C/N ratio, chemically treated sawdust was inoculated with Coprinus ephemerus. This organism proved to be efficient in decomposition of cellulose, and within 3 months converted sawdust into a finely divided dark brown material which resembled a rich mull-like soil in appearance. The fermentation was invariably accompanied by a volunteer invasion of fungus gnats. Sciaridae spp., and many other microorganisms. Application of composted sawdust to a sandy soil produced marked increase in the growth of both coniferous and deciduous seedlings and medium red clover.

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CONTINUOUS ORGANIC MATTER SUPPLY--THE KEY TO SOIL AGGREGATION AND BIOLOGICAL ACTIVITY

By J. H. Stallings. Jour. Soil and Water Conserv. 8: 178-184. 1953.

Organic matter is shown to be the source of the cementing substances which bind soil grains into aggregates. These cementing substances are subject to destruction by other soil organisms, consequently their effects are transitory. A continuous supply of organic matter must be available to provide replacement of these cementing substances or aggregation of the soil will deteriorate. Organic matter is more effective in the aggregation process when utilized on the surface of the ground than when turned under. It is most effective when utilized as a sod or continuous surface mulch. Those cropping systems and other soil and crop management practices which disrupt the surface supply of organic materials affect soil aggregation adversely. Both quantity and quality of organic matter are important in the aggregation process but quality is more important than quantity. Those conditions favoring a high level of soil biological activity also favor a high state of aggregation and usually a high level of productivity. Well aggregated soils generally are more productive than poorly aggregated soils.

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Tillage and Cultural Practices

TILLAGE METHODS AND CROP ROTATIONS IN SOUTHWESTERN NORTH DAKOTA

By R. J. Douglas and T. J. Conlon. N. Dak. Agr. Expt. Sta. Bul. 381. 1953.

This bulletin reports the results obtained in the 45-year period 1908-1952. During the relatively short span of years that Western North Dakota has been cultivated, soil erosion by wind and water has become a serious problem. Erosion and continuous small grain cropping resulted in reduced yields and presented a real problem in soil conserving and soil building. Results indicate that the tillage methods and crop history of the land during any previous year have a very important effect on the small grain yields in the subsequent years. The choice of tillage method and crop rotation may greatly influence the cost of production and total yield of all crops or net income over the years.

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MULCH-PLANTED CORN PERFORMS WELL IN 1952 WISCONSIN TEST

By L. E. Engelbert. Crops and Soils 5(7): 26. 1953.

By using a mulch planter, top corn yields were obtained without plowing and with only one cultivation. The corn was planted on a field of old legume sod which was heavily infested with quackgrass. The field was disked twice. Eight hundred pounds of 10-10-10 per acre were placed 9 in. deep and 300 pounds of 4-16-16 were drilled in the row. The corn yielded 135 bushels per acre, 4 bushels more than a 131-bushel yield from another part of the field getting the same fertilizer treatment, but receiving standard cultivation in place of the mulch-planter treatment.

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SURFACE COVER KEEPS SOILS PRODUCTIVE IN HOT REGIONS

By G. D. Sherman and Y. Kanehiro. Crops and Soils, 5(7): 16-17. 1953.

Plant cover; either as mulch or a growing crop, delays the breakdown of tropical soils which have been put into cultivation. This paper explains how plant cover eliminates rapid deterioration of tropical soils.

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THE EFFECT OF THE ADDITION OF ORGANIC MATERIALS ON THE DECOMPOSITION OF AN ORGANIC SOIL

By C. W. Bingeman, J. E. Varner, and W. P. Martin. Soil Sci. Soc. Amer. Proc. 17: 34-38. 1953.

Glucose, alfalfa insolubles, and complete alfalfa uniformly labeled with carbon-14 were added to an organic soil to determine, under controlled conditions, if the loss of the soil due to biological decomposition could be counteracted. The materials were added, the soil incubated, and CO_2 collected at intervals. The insoluble fraction of alfalfa caused a larger breakdown of native organic matter than solubles alone or complete alfalfa. It was impossible to build up the organic content of the soil, under these conditions, but the net loss of carbon was diminished by the addition of the organic materials.

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DEEP PLOWING OF SANDY SOILS

By W. M. Nixon. Better Crops with Plant Food 37: 23, 40-42. 1953.

Deep plowing of sandy soils for wind erosion control will eventually do more harm than good if not used in combination with vegetative practices.

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WIDER CORN ROWS

By G. H. Stringfield and J. L. Haynes. Ohio Agr. Expt. Sta. Farm and Home Res. 38: 20, 30. 1953.

The average acre yield of corn planted in rows 70 in. apart with the plants spaced 6 2/3 in. in the rows was only about 9 bushels lower than yields from fields with 40 in. rows and plants spaced 10 in. in the row. This decrease in yield is more than made up for by permitting the planting of wheat between unharvested rows or summer-seeded interplantings of plowdown crops and even of meadow crops.

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STUBBLE-MULCH TILLAGE IN NEW YORK

By G. R. Free. Soil Sci. Soc. Amer. Proc. 17: 165-170. 1953.

This paper reports progress made in adapting subble-mulch tillage for use under the cool, humid conditions of New York State. Comparisons of stubble-mulch plowing over a period of 7 years in the state are presented and discussed. Soil penetrometer and moisture data showed that the new stubble-mulch plowing produced a seedbed as loose as that obtained by turn plowing and also resulted in moisture conservation through concentration of crop residues on the surface. At the same time, there were indications that disking resulted in a seedbed more difficult to penetrate with the penetrometer and also one from which moisture was used inefficiently for crop production and lost by excessive evaporation regardless of the presence of a residue mulch.

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FALL VS. SPRING PLOWING AND SOIL PHYSICAL CONDITIONS IN A ROTATION EXPERIMENT

By. M. F. DeBoodt, A. J. Englehorn, and D. Kirkham. Agron. Jour. 45: 257-261. 1953.

In a corn-oats rotation initiated in 1940 on a dark brown prairie soil, fall plowing, as compared with spring plowing, brought highly significant yield increases in corn in one year only, 1951. In the preceding years, the increases were in favor of fall plowing every year, but not at statistical levels of significance. Sweetclover planted as a catch crop with oats increased corn yields significantly. Return of the oat straw, rather than removing it, did not increase yields significantly but did increase the air permeability of the soil highly. Of several physical measurements used to evaluate physical conditions of the soil, air permeability, as measured on undisturbed air-dried soil clods appeared to be the most sensitive.

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Equipment

COTTON PICKER SACKING ATTACHMENT FOR HARVESTING SMALL PLOTS

By H. P. Smith and E. C. Brown, Jr. Agr. Engin. 34: 234. 1953.

A sacking attachment for a mechanical cotton picker to facilitate the harvesting of small field plots is described. It consists of an inverted U-shaped duct which is joined at one end to the regular basket duct. A two-way lip valve is installed at the junction of the sacking duct and the regular duct. A lever on the outside is conveniently located so that the picker operator can easily and quickly flip the valve. Swinging the valve across the regular duct allows the cotton to be blown into a sack hooked to the opposite end of the sacking duct. When the valve is swung across the opening into the sacking duct, the cotton is blown through the regular duct into the cotton picker basket.

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MORE DURABLE PLASTER OF PARIS SOIL MOISTURE BLOCKS PERFECTED

By G. J. Bouyoucos. Mich. Agr. Expt. Sta. Quart. Bul. 35: 460. 1953.

More durable plaster of paris blocks for measuring soil moisture electrically have been perfected by treating the blocks with plastic resins.

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CROPS

General

NURSERY TESTS THE BEST IN SCIENTIFIC FARMING

By H. R. Slayback and W. A. Mitcheltree. Jour. Soil and Water Conserv. 8: 114-117. 1953.

Complete soil management can be obtained by matching the crop to the soil, soil and water conservation measures, liming, fertilization, cover crops and rotations. The theme of this article is that these facts are no longer in the realm of theory but necessary practical needs to secure maximum crop yields.

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GENERAL FERTILIZER RECOMMENDATIONS FOR ALABAMA

Ala. Agr. Expt. Sta. Spec. Leaf. Mar. 1953.

This leaflet contains general fertilizer recommendations for important agricultural crops on the more extensive soil types of the state. The recommendations are based on results obtained from field tests conducted in the various soil regions. Ninety-six pounds of N, 96 pounds of P_2O_5, and 24 pounds of K_2O per acre are recommended for fish ponds. These amounts are equivalent to 1,200 pounds of 8-8-2; or 1,200 pounds of 6-8-4 plus an application of 120 pounds of nitrate of soda or 60 pounds of ammonium nitrate per acre. It is best to split the foregoing amounts into 10 equal applications distributed over the entire year.

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A DROUGHT CRITERION AND ITS APPLICATION IN EVALUATING DROUGHT INCIDENCE AND HAZARD

By C. H. M. van Bavel. Agron. Jour. 45: 167-172. 1953.

This paper proposes a method by which a desirable drought criterion might be developed. It takes into consideration soil moisture conditions and resultant plant behavior. It is proposed that the incidence of drought be characterized by determining for a particular crop the number of days during the growing season on which soil moisture tension exceeds a value which is known to impede appreciably crop growth.

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Field Crops

THE USE OF FUZZY, MACHINE, AND CHEMICALLY-DELINTED COTTON SEED FOR PLANTING ON THE HIGH PLAINS OF TEXAS

By E. B. Hudspeth, L. L. Ray, and D. L. Jones. Tex. Agr. Expt. Sta. Prog. Rpt. 1547. 1953.

This is a report of an experiment to determine the influence of seed delinting on stands of irrigated cotton and the relation to mechanized harvesting. Data were obtained in 1949-52. There is no advantage, from the standpoint of emergence or yield, in using fuzzy, machine or chemically-delinted seed for planting. Delinted seed are easier to handle and plant, and would be preferred if the planting rate is sufficient to produce a high plant population.

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RELIANCE--AN EARLY GRAIN SORGHUM

By C. J. Franzke. S. Dak. Agr. Expt. Sta. Bul. 426. 1953.

Reliance, a new grain sorghum for South Dakota, stands longer after a killing frost and has a wider range in planting time than Sorghum. It is also larger seeded and has a sturdier stalk.

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COTTON DEFOLIATION TESTS AT LUBBOCK, 1951-52

By E. L. Thaxton, Jr., D. L. Jones, and E. B. Hudspeth. Tex. Agr. Expt. Sta. Prog. Rpt. 1550. 1953.

Results of the tests show slight varietal differences occur when all varieties are at least 2/3 open at the time of application of defoliants. Nitrogen fertilizer alone has little effect on defoliation. Late irrigations lower the percent of defoliation. Plant population showed no significant difference in defoliation. Sodium cyanamid, calcium cyanamid (with dew) and Endothal defoliants gave acceptable results.

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THE AVAILABILITY OF PHOSPHORUS TO ALFALFA IN THE HORIZONS OF FOUR EASTERN NEBRASKA SOILS

By E. J. Dennis and L. Chesnin. Soil Sci. Soc. Amer. Proc. 17: 49-52. 1953.

Four soils of eastern Nebraska were sampled by horizons to determine their availability of phosphorus to alfalfa. Alfalfa was grown on part of each sample which was treated with phosphate fertilizer, and part which was left untreated. The growth and composition of alfalfa made on the untreated soil provided a measure of the availability of phosphorus in the soil horizon. The growth and composition of alfalfa on the phosphate-treated soil provided a measure of the growth alfalfa could make on a given horizon if phosphorus were not limiting. Phosphate treatment increased the yield and influenced the composition of alfalfa generally. The total nitrogen, phosphorus, and magnesium uptake by the alfalfa was increased with the phosphate application. Phosphate tended to reduce the total calcium uptake of the alfalfa tops. The total cation content of the alfalfa tops was quite constant. In addition, phosphate appears to have played an important role in the fixation of nitrogen by alfalfa in these phosphorus-deficient soils. A variation was found in the phosphorus-supplying capacity of the different soil horizons.

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FERTILIZER TESTS WITH FLUE-CURED TOBACCO

By F. Clark. Fla. Agr. Expt. Sta. Bul. 512. 1953.

Fertilizer tests with flue-cured tobacco were conducted on Norfolk fine sand during the 1939-1944 seasons. Nitrogen stimulated growth more than any other element tested. The optimum rate of nitrogen for tobacco was 30 pounds per acre. Nitrogen was essential for the production of a vigorous, leafy plant. Heavy rates of nitrogen must be balanced with phosphorus to insure ripening and potash must be increased to maintain good quality. Results of single-source applications of nitrogen were not as good as a combination of sources. A nitrogen ratio of one-third each from sodium nitrate, ammonium sulfate, and urea produced highest yields with good quality.

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INFLUENCE OF ALFALFA GREEN MANURE ON THE AVAILABILITY OF PHOSPHORUS TO CORN

By K. F. Nielsen, P. F. Pratt, and W. P. Martin. Soil Sci. Soc. Amer. Proc. 17: 46-49. 1953.

Greenhouse work was conducted in which alfalfa and KH_2PO_4, singly and in combination, were used as phosphate fertilizers. These materials were layered into pots of Wooster silt loam representing three levels of residual phosphorus. The availability to corn of the phosphorus in these carriers of phosphorus and in the soil was measured by the use of radiotracer techniques. A series of Neubauer tests were carried out to determine the time rate of release of phosphorus from alfalfa. Results indicate that the phosphorus in the alfalfa was not as available as in the KH_2PO_4. However, the alfalfa increased the availability of the residual phosphorus. The Neubauer tests indicated that the phosphorus from the alfalfa was most available during the period between 46 and 64 days after being incorporated.

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WATER USE BY CROPS AS DETERMINED BY WEIGHING AND MONOLITH LYSIMETERS

By L. L. Harrold and F. R. Dreibelbis. Soil Sci. Soc. Amer. Proc. 17: 70-74. 1953.

The purpose of this study was to present information on water use by crops as determined from evapotranspiration data. Additional information on the accretion, depletion, and storage of soil water as influenced by soil type and land use effects is also included. Water use by crops during the growing season is evaluated in terms of weight of water used to produce one pound of crop. Daily soil moisture, accumulated daily precipitation, evapotranspiration, and percolation data are presented in graphs for 1951 from three lysimeters each representing a different soil type.

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THE EFFECT OF SPRING NITROGEN FERTILIZATION ON PLANT CHARACTERISTICS OF WINTER WHEAT

By J. A. Hobbs. Soil Sci. Soc. Amer. Proc. 17: 39-42. 1953.

A study designed to determine the effect of nitrogen topdressing on plant characteristics, yield, and protein content of winter wheat was undertaken at Kansas State College in the spring. Nitrogen fertilizer was applied prior to March 15 to strips of winter wheat in the permanent fertility plots. Yield, protein content, and other data were collected from the topdressed and the untreated areas. The results indicated that spring applications of nitrogenous fertilizers increased the yield and also increased the protein content. The increases in yield were especially prominent on the plots which were adequately supplied with phosphate.

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YIELD AND VEGETATIVE AND CHEMICAL COMPOSITION OF FORAGE CROPS AS AFFECTED BY SOIL TREATMENT

By J. L. Parsons, M. Drake, and W. G. Colby. Soil Sci. Soc. Amer. Proc. 17: 42-46. 1953.

Field studies were conducted on Ladino clover, orchardgrass, smooth bromegrass, and timothy. Each species was planted in a pure stand to determine its requirements with respect to P and K. Increases of 30% to 80% in hay production were obtained when adequate K was applied. Split applications of K fertilizer were used instead of single large applications. Although the percentage P in the plant material increased with added increments of P, there was no appreciable yield response to P on most species above the lowest P rate. Although liberal amounts of fertilizer potash were applied to the grasses studied, there was nearly complete removal of applied K (79 to 94%).

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A PRELIMINARY STUDY ON THE EFFECT OF SOME FUNGICIDES ON THE ESTABLISHMENT OF FORAGE SEEDLINGS

By R. S. Fulkerson. Canada. Jour. Agr. Sci. 33: 30-40. 1953.

Several fungicides were used as seed treatments on eight grasses and five legumes commonly used in hays and pastures. The seeds so treated were grown in different soil types that gave wide differences in seedling establishment. Legume seedlings were found to be more severely attacked by damping-off organisms than grass seedlings. Leytosan P. gave good results when applied to most grasses and legumes and excellent results when applied in excess amounts with red clover and alfalfa. Spraying the soil with the liquid fungicide Vancide-51 proved promising in establishing legumes.

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NEW CHEMICAL AIDS HARVEST OF LEGUME SEED CROPS

By J. T. Medler. Crops and Soils. 5(8): 18-19, 30. 1953.

Endothal, a new drying agent, may make field harvesting of legume seed crops a much easier job. It dehydrates the green leaves and stems of seed crops, and it has shown considerable promise.

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STANDARD FERTILIZATION AND THE QUALITY OF CROPS

By A. Aslander. Soil Sci. 74: 431-442. 1952.

Yields from field experiments on standard-fertilized acid soils unlimed and limed from 1/32 to full lime-absorbing capacity, or neutrality, were tested in various ways to determine the influence of liming the soil on the quality of the crops. The results indicate that standard fertilization brings about an optimal nutritional standard in the soil, so that previously low-yielding acid soils produce such heavy yields and crops of such good quality that liming cannot materially improve the quality or quantity of the yields.

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EFFECT OF DEPTH OF TOPSOIL ON YIELD OF GRAIN, KEWAUNEE SOILS AREA--1952

By C. E. Bay. U. S. Dept. Agr. Soil Conserv. Serv. and Wis. Agr. Ext. Serv. May 1953. (Mimeo.)

Oats yielded an average of 52 bushels per acre where there were 3 inches or less of topsoil, 57.5 bushels where there were 3 to 6 inches of topsoil, and 62.8 bushels where there were 6 inches or more of topsoil. These differences in depths of original topsoil caused 17.2% decrease in yield or 10.8 bushels per acre per year. Similar results were obtained from barley. Nitrogen was considered to be the most important limiting factor in grain production on the eroded soils.

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RESPONSE OF SUGAR BEETS TO PEROXIDE FERTILIZATION AND ITS RELATIONSHIP TO OXYGEN DIFFUSION

By D. Wiersma and M. M. Mortland. Soil Sci. 75: 355-360. 1953.

This experiment was designed to determine whether the growth of sugar beets could be benefited by addition of an oxygen fertilizer to the soil, and if so, what is the relationship to the rate of oxygen diffusion through the soil. The study indicates that oxygen can be a limiting factor in the growth of sugar beets, and its deficiency may be corrected by the use of peroxides.

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A STUDY OF SOIL AND FERTILIZER PHOSPHORUS UPTAKE ON A CALCAREOUS SOIL BY OAT PLANTS, USING RADIOACTIVE TRACER TECHNIQUE

By D. D. Dalson and J. W. Ketcheson. Canada. Jour. Agr. Sci. 33: 225-230. 1953.

Two greenhouse experiments were conducted, using oat plants as the indicator crop, to determine the effects of starter and complete applications of phosphate fertilizer to a high-grade soil. In experiment 1, the addition of starter applications of monocalcium phosphate gave significant increases in total dry weight and total phosphorus uptake at 4 and 12 weeks after germination. Further significant increases were obtained when the entire root feeding zone was fertilized. In experiment 2, starter applications of monocalcium phosphate applied to soil layers less than 1 inch in depth gave no significant increase in yield or total phosphorus uptake 4 weeks after germination. Treatment on a one-inch-deep layer produced significant increases in dry weight and total phosphorus uptake. More extensive treatment gave further increases.

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CHEMICAL CURING AIDS COMBINING; INCREASES ALFALFA SEED YIELDS

By D. Fleming. Crops and Soils 5(7): 23. 1953.

Chemically curing the alfalfa seed crop with a contact spray, then combining the crop standing 2 or 3 days later boosted yields 11 to 38%.

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CORRELATION BETWEEN NITRIFIABLE NITROGEN AND YIELD RESPONSE OF CORN TO NITROGEN FERTILIZATION ON IOWA SOILS

By J. W. Fitts, W. V. Bartholomew, and H. Heidel. Soil Sci. Soc. Amer. Proc. 17: 119-122. 1953.

Nitrification rate is proposed as a procedure for evaluating nitrogen requirements of soils for the production of corn. By the use of a modified nitrification method the rate of nitrate production was compared with the response of corn to nitrogen fertilizer in a series of experiments conducted in Iowa over a period of seven years. A significant correlation was obtained between nitrification rate and the response of corn to the application of 40 to 60 lbs. of nitrogen per acre.

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BALANCED NUTRITION IMPROVES WINTER WHEAT ROOT SURVIVAL

By P. E. Johnson. Better Crops with Plant Food 37(3): 6-10, 49-50. 1953.

Balanced nutrition is essential for maximum growth and survival of winter wheat roots. During 1951-52, winter injuries of wheat were increased by deficiencies of either limestone, phosphates, or potash. Any one nutrient deficiency can upset the whole farming program.

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KUDZU KEEPS GROWING DURING DROUGHTS

By T. C. Maurer. Better Crops with Plant Food 37(2): 11-14, 43. 1953.

Some 428,328 acres of kudzu were utilized for grazing or hay in the southeast during the past dry summer. It proved highly satisfactory and its ability to withstand prolonged drought endeared it to many farmers who did not have kudzu on their farms.

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COTTON FERTILIZER TESTS IN THE EL PASO AREA, 1943-51

By P. D. Christensen and P. J. Lyerly. Tex. Agr. Expt. Sta. Bul. 758. 1953.

For highest cotton production, rotate cotton with alfalfa. Under an alfalfa-cotton rotation, apply phosphorus to alfalfa and eliminate phosphorus applications to cotton. A laboratory test for available soil phosphorus is suggested as an aid in determining whether to apply fertilizer. Apply nitrogen fertilizers to cotton annually after the second year following alfalfa. Sixty to 80 pounds of nitrogen per acre are suggested. Applications of potassium or the trace elements are not recommended.

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CHEMICAL INVESTIGATIONS OF THE TOBACCO PLANT: IX. THE EFFECT OF CURING AND OF FERMENTATION ON THE COMPOSITION OF THE LEAVES

By H. B. Vickery and A. H. Meiss. Conn. Agr. Expt. Sta. Bul. 369. 1953.

The major rapid chemical changes that occur are restricted to the first 8-12 days of the curing operation. Subsequent changes are slow although for the most part continuous. During curing, about 97% of the initial water evaporates from the leaves, the greater part of this during the first 12 days at which time the leaves had become brown in color. During the remainder of the curing period, the color became more uniform over the entire surface of the leaves, but the chemical composition changed only a little.

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PHOSPHORUS COMPOUNDS IN COTTONSEED KERNELS--INFLUENCE OF VARIETY OF COTTONSEED AND ENVIRONMENT

By M. F. Stansbury, W. A. Pons, Jr., and C. L. Hoffpauir. Jour. Agr. and Food Chem. 1: 75-78. 1953.

The importance of the role of the several types of phosphorus compounds is recognized by investigators in the field of nutrition. This paper reports data for seven types of phosphorus compounds in 58 samples of cottonseed kernels selected so that the effects of varietal and environmental factors could be indicated. Statistical examination of the data indicated that the influence of environmental factors on the values for total, acid-soluble, phosphatide, inorganic and phytin phosphorus calculated to either a moisture-free or moisture- and oil-free basis was highly significant statistically as compared to varietal factors. A significant correlation coefficient (+0.989) was obtained for the relationship between total phosphorus and phytin phosphorus contents of the moisture-free kernels.

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THE PERFORMANCE OF LESPEDEZA STRAINS IN NORTH CAROLINA SOILS INFESTED WITH ROOT-KNOT NEMATODES

By C. H. Hanson, J. L. Allison, and D. S. Chamblee. Agron. Jour. 45: 143-146. 1953.

Root-knot nematode indices, forage yields and other data are presented for 16 annual lespedeza strains and varieties grown on an infested area at Willard, N. C. Forage yields are also given for a selected group at four other locations. Strains were found to differ significantly in resistance to the root-knot nematodes encountered at these locations. Differences in forage yields decreased with lower levels of infestation.

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THE EFFECT OF PHOSPHATIC FERTILIZER MATERIAL AND SOIL PHOSPHORUS LEVEL ON THE YIELD AND PHOSPHORUS UPTAKE OF SOYBEANS

By M. F. Bureau, H. J. Mederski, and C. E. Evans, Agron. Jour. 45: 150-154. 1953.

This study was to determine the effect of different phosphatic fertilizer materials and soil phosphorus levels on the yield and phosphorus uptake by the soybean plant. The percentage of the total phosphorus derived from the fertilizer was found to be inversely related to the level of soil phosphorus. The type of fertilizer greatly affected the relative amounts of native and fertilizer phosphorus absorbed by plants.

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ROW CROP AUXILIARY

By D. L. Wilson and W. W. McPherson. N. C. Agr. Expt. Sta. Res. and Farming 10(4): 13. 1953.

A farm management study of the beef cattle enterprice on 73 farms has shown that beef production is a profitable supplement to tobacco and other cash crops on many eastern North Carolina farms.

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THE EFFECT OF COST FUNCTIONS AND NUMBER OF REPLICATIONS AND SAMPLES PER PLOT IN FIELD PLOT EXPERIMENTS OF OATS

By K. G. Frey. Agron. Jour. 45: 265-267. 1953.

Cost functions and the empirical formula developed by Smith for determining optimum plot size were applied to data obtained from six oats experiments to determine the optimum number of replications and samples per plot to obtain a degree of precision, in this case, such that the standard error of the difference between two variety means was equal to 6% of the general means.

It was found that the cost per plot was approximately three times the cost per sample in this set of experiments. The range in regression coefficients for Smith's formula was from 0.394 to 1.074, and the average was 0.744. On the basis of this data, the optimum whole number of replications per variety and number of samples per plot were found to be four and five, respectively.

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2,4-D + NITROGEN--GARLIC CHECKREIN

By G. C. Klingman. N. C. Agr. Expt. Sta. Res. and Farming. 10(4): 9. 1953.

A superduper dose of 2,4-D at the right time plus heavy spring growth of the oats through good management may be the answer to controlling wild garlic in oats.

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POLLINATION OF HUBAM CLOVER BY HONEYBEES

By N. Weaver, A. H. Alex, and F. L. Thomas. Tex. Agr. Expt. Sta. Prog. Rpt. 1559. 1953.

With adequate numbers of honeybees, Hubam clover will yield about 10 times as many seed per acre as clover from which pollinating insects are excluded.

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POLLINATION OF CRIMSON CLOVER BY HONEYBEES

By N. Weaver and R. N. Ford. Tex. Agr. Expt. Sta. Prog. Rpt. 1557. 1953.

Crimson clover with adequate numbers of honeybees yields about four times as many seeds as clover with no honeybees. One colony of bees per acre of crimson clover should be sufficient to saturate a field, providing other plants do not compete for the bees' visits.

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CORDOVAN BARLEY

By I. M. Atkins. Tex. Agr. Expt. Sta. Bul. 760. 1953.

This bulletin reports the development and characteristics of Cordovan, a new superior barley variety for the Rolling Plains and Central Texas. It was developed from a cross between the varieties Texan and Wintex which are now seeded on most of the Texas barley acreage.

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CHEMICAL COMPOSITION OF WEEDS AND ACCOMPANYING CROP PLANTS

By J. Vengris, M. Drake, W. G. Colby, and J. Bart. Agron. Jour. 45: 213-218. 1953.

High phosphorus accumulation in weeds indicates that they are competing with cultural plants for this element, especially when quantities of available soil P are inadequate. On the other hand, high P level in weeds, even with low levels of available P in the soils, indicates an ability on the part of many weeds to utilize forms of soil phosphates which are relatively unavailable to many cultivated plants. The role of some plant species in releasing P that is not readily available in the soil has not been appreciated.

Weeds in general, and especially dicots, have a rather high content of minerals and protein. Weeds are able to accumulate about as much Ca and Mg as the legumes and as large or larger amounts of K as the grasses.

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HEADING OF PERENNIAL GRASSES UNDER GREENHOUSE CONDITIONS

By A. A. Hanson and V. G. Sprague. Agron. Jour. 45: 248-251. 1953.

Orchardgrass, meadow fescue, bromegrass, and reed canarygrass initiated floral primordia, headed and flowered earlier when subjected to low temperatures (55°F.) under short days and subsequently to high temperatures (75°F.) under long days. Timothy did not respond to the short-day treatments, but headed and flowered earlier when maintained at high temperatures (75°F.) under long days.

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INSECTICIDE TOXICOLOGY: MANIFESTATIONS OF COTTON-FIELD INSECTICIDES IN THE MISSISSIPPI DELTA

By R. E. L. Fowler. Jour. Agr. and Food Chem. 1: 469-473. 1953.

A survey of school attendance records for white children in one Delta county, mortality figures for the entire state of Mississippi, and morbidity figures for a Delta plantation hospital was undertaken to determine the possible toxic hazard from the use of modern insecticides. In all studies reported, no evidence could be found that pesticides were the direct or indirect cause of any chronic disease or a contributing cause in diseases generally recognized as having other etiologies.

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PHOSPHATE FURNACE SLAG VS. LIMESTONE, A 10-YEAR LYSIMETER STUDY OF SOIL LIMING

By W. H. MacIntire and A. J. Sterges. Jour. Agr. and Food Chem. 1: 370-378. 1953.

A study was made of the behavior and effect of a phosphate furnace slag after incorporation in the soil and as a possible hazardous source of fluorides in adjacent ground waters. Incorporated slag underwent transition to calcium carbonate, large quantities of which were accounted for as bicarbonate outgo and as cumulative residues. Calcium outgo from the slag, at different input rates and various fineness, exceeded outgo from corresponding inputs of limestone and caused repressions in outgo of magnesium and potassium. Solute outgo from upper-zone incorporations was less than that from full-depth incorporations. Effect of particle size upon outgo was decidedly less for slag than for limestone. The proportions for outgo of calcium were greater in the initial 5 years. The concentrations of fluorides into drainage were attributable to leachings of calcium silicofluoride. The slag proved decidedly more reactive than the limestone, while releasing relatively large amounts of fluoride, passage of which was impeded during drainage through lower strata. Apparently, use of the phosphate furnace slag will not cause detrimental concentrations of fluorides in nearby ground waters.

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PERFORMANCE OF RESEEDING CRIMSON CLOVER IN ARKANSAS

By P. C. Sandal. Ark. Agr. Expt. Sta. Farm Res. 2(2): 6. 1953.

Several new varieties of reseeding crimson clover have been developed in recent years, and at present 5 commercially important new strains are on the market. The Experiment Station has been studying the performance of crimson clover and the new reseeding strains. The reseeding characteristic of these strains appears to be associated with a moderately high percentage of hard seed. These hard seeds germinate gradually over a considerable period of time during the fall months. This helps insure natural reseeding, even though one or more sets of seedlings may be killed during periods of dry weather after germination starts.

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EFFECT OF FERTILIZERS ON THE YIELD AND COMPOSITION OF RANGER ALFALFA HAY

By C. W. Jones, D. W. Pittman, R. Weiman, Mahd Habib, O. Asplund, M. C. Cannon, and D. A. Greenwood. Jour Agr. and Food Chem. 1: 167-169. 1953.

Fertilizer experiments showed that addition of phosphate fertilizers to soils low in available phosphorus and high in lime generally increased alfalfa yields. In some cases, one application increased yields significantly for 5 years. The cobalt content of alfalfa was increased by addition of cobaltous chloride to soil. The manganese content of alfalfa hay was generally increased by addition of manganese sulfate to the soil, but the effect was significant for only 2 years. Copper applied as copper sulfate increased the copper content of the hay for 2 years. Addition of trace elements did not increase the yield of alfalfa hay.

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AN EXAMPLE OF FRACTIONAL REPLICATION IN AN EXPERIMENT ON SUGAR CANE MANURING

By T. Chinloy, R. A. Innes, and D. J. Finney. Jour. Agr. Sci. 43: 1-11. 1953.

Study of the nutritional requirements of sugar cane necessitated simultaneous experimentation with five fertilizer factors: sulphate of ammonia, superphosphate, muriate of potash, bagasse, and filter-press mud. By adopting a one-third replication of a 3^5 factional scheme, each factor could be tested at single and double levels for comparison with the absence of these factors.

Fractional replication introduces special problems of interpretation, and this experiment illustrates how they may be resolved. Each fertilizer clearly benefitted the crop, and several interactions appeared.

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GRASSES AND LEGUMES--PRODUCTION AND MANAGEMENT IN SOUTH DAKOTA

By W. W. Worzella, L. O. Fine, J. G. Ross, M. W. Adams, L. F. Puhr, P. L. Carson, and B. L. Brage. S. Dak. Agr. Expt. Sta. Bul. 427. 1953.

Satisfactory stands of forage crops are obtained by seeding not more than one-half to one-inch deep in early spring on a clean firm seedbed. The inoculation of legumes, seed treatment on grass seeds and the use of starter fertilizer is recommended.

The use of legumes and grasses in crop rotations is the foundation of a sound soil fertility and soil building program. Legumes and grasses enrich the soil in nitrogen and organic matter, improve the tilth or soil structure and protect the soil from erosion. The yields of corn and small grains will be substantially increased by legume-grass cropping systems.

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ALFALFA SEED PRODUCTION IN ALABAMA AS AFFECTED BY VARIOUS TREATMENTS

By W. E. Knight. Better Crops with Plant Food 37: 21-22, 36-38. 1953.

A fertilizer and method-of-planting experiment was conducted on Norfolk loamy sand to determine the effects on alfalfa seed production of (a) various rates and combinations of lime and borax and (b) row versus broadcast seedings. Seed yields were more than doubled by applications of borax previous to planting. Hay yields were not significantly different.

Twenty pounds of borax per acre applied at planting time in 1947, and 10 pounds per acre applied annually thereafter increased seed yields from 58 to 189 pounds per acre. The same treatment starting in 1948 increased seed yields from 59 to 115 pounds of seed per acre.

The methods of planting used did not change seed yield appreciably. However, hay yields were considerably higher on broadcast plots.

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CALCIUM UPTAKE BY TOBACCO FROM BAND APPLICATIONS OF FERTILIZER MATERIALS

By J. M. Blume and N. S. Hall. Soil Sci. 75: 299-306. 1953.

An experiment in which radiocalcium was used to measure the contribution of $CaH_4\ (PO_4)_2,\ H_2O$, $CaCO_3$, and $Ca\ SO_4$ to the calcium nutrition of the tobacco plant was carried out on a moderately fertile Norfolk loamy sand in the field.

The results indicated that the plants derived only 2 to 6 percent of their calcium from these fertilizer salts, even though the soil was not particularly well supplied with this element. In contrast, 26-35 per cent of the phosphorus in the plant was derived from the application of $CaH_4\ (PO_4)_2\ H_2O$, despite the fact that the available phosphorus content of the soil was high.

Calcium was utilized more efficiently by tobacco when the three salts were applied in individual bands 3 inches apart than from a single band of the mixed salts.

Both calcium and phosphorus derived from fertilizer applied in a band to the side of the plant were accumulated in the leaves directly above the fertilizer band to a larger extent than in the leaves on the opposite side of the plant.

Analysis of soil samples taken at the conclusion of the growth period indicated that there had been no movement of calcium from the fertilizer materials more than 3 inches laterally or 4 inches downward. It is concluded that, with proper precautions, radiocalcium can be used safely in field experiments.

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PRELIMINARY REPORT ON THE EFFECT OF SPRAY FOR CORN BORER CONTROL ON YIELDS OF FIELD CORN

By G. F. H. Buckley and C. G. Mortimore. Can. Jour. Agr. Sci., 33: 288-290. 1953.

Experiments were conducted in 1950 and 1951 to study the effects of one and two sprays of parathion and DDT upon the yields of shelled corn. In 1950 an average increase in yield of 8.9 bushels per acre was obtained with two sprayings of parathion. In 1951 a single application of DDT gave average increase of 13.9 and 17.1 bushels of corn for the first and second dates of spraying respectively while two sprayings gave an average increase of 16.6 bushels. The results indicate that one spraying, applied 7-10 days after egg-mass counts reach 50 per 100 plants, is just as effective in increasing yields as two sprayings.

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COPPER SULPHATE FOR THE CONTROL OF DAMPING-OFF IN TOBACCO SEEDBEDS

By R. G. Orellana. Phytopathogy, 43: 125-127 1953.

Control of damping-off of Virginia and Burley tobacco was attempted by applying agrueous solutions of copper sulphate to the soil at the rates of 2, 20, 30, 50 and 100 gm. per square meter of seedbed. The 2-gram rate was ineffective. The 20-gram rate gave only temporary control. The 30-gram rate checked the spread of the disease, but the 50 and 100 gram rates of copper sulphate excessively reduced seed germination and produced toxicity symptoms on seedlings. Transplants from the beds treated with 30 and 50 grams developed normally, while those from the 100 gram treatments remained stunted.

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Pasture and Range

IMPROVING CALIFORNIA BRUSH RANGES

By R. M. Love, D. C. Sumner, and V. P. Osterli. Calif. Agr. Expt. Sta. Cir. 371. 1952.

More meat and more wool have been produced in California on some brushlands that have been cleared and converted into pasturage for cattle and sheep. A good brush clearance program must be well planned if it is to succeed. T is circular offers information on three basic steps:

(1) Removal of brush, (2) revegetation of cleared areas, and (3) control of grazing.

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WINTER CLOVERS IN CENTRAL FLORIDA

By E. M. Hodges, D. W. Jones, and W. G. Kirk. Fla. Agr. Expt. Sta. Bul. 517. 1953.

Forage crops that endure frost and grow during cool winter weather can fill a valuable place in the pasture needs of central Florida. Certain clover varieties meet these requirements. Clover herbage may have a protein content of 20% or more on a dry basis, thus supplying much-needed feeding quality at a critical period of the year. Some of the nitrogen fixed by the clover remains in the soil to benefit the associated grasses for three to five months after the legume crop has completed growth, thus influencing pasture over a long season.

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FROST HEAVING OF GRASS AND BRUSH SEEDLINGS ON BURNED CHONISE BRUSHLANDS IN CALIFORNIA

By H. H. Biswell, A. M. Schultz, D. W. Hedrick, and J. I. Mallory. Jour. Range Mangt. 6: 172-180. 1953.

Frost heaving of reseeded grasses and legumes on burned-over chonise brushlands in California was studied over a 4-year period. The studies were in an area where the soil is often fluffy after fire and where alternate freezing and thawing is common. In many cases, there was no frost heaving, but frequently it accounted for 75% or more mortality. Legumes were affected more severely than grasses. Plants on north exposures were heaved more severely than those on south exposures. Smilo with its fine roots was heaved more severely than harding grass with its coarse roots. Strong and well established plants heaved less than younger and less well established plants of the same species.

Frost heaving is effectively reduced when the soil is well covered by mulch. Early planting and fertilizing is helpful in developing a strong plant before the frost heaving period.

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A NEAR PERFECT TURF FOR ALL-SEASON SERVICE

By F. V. Grau and A. M. Radko. Crops and Soils 5(8): 16-17. 1953.

The authors believe that by combining a good warm-season grass with a good cool-season grass, it will be possible to provide year-round satisfactory turf with good color. Japanese lawn grass (Zoysia japonica) used as the warm-season grass and Merion bluegrass used as the cool-season grass makes an excellent combination for Beltsville, Md. Fertilizer should be applied at a time when it will most favor the weakest member of the combination.

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THE PRODUCTION OF TOPS AND ROOTS BY GRASS AND SWEETCLOVER WHEN GROWN IN MIXTURES

By J. L. Schwendiman, A. L. Hafenrichter, and A. G. Law. Agron. Jour. 45: 110-114. 1953.

This paper reports yields of tops and roots of sweetclover and five selected grasses from seedlings made in four successive years. Mixtures of grass with sweetclover gave as much total root production as sweetclover grown alone. Grasses differed in total production when grown with sweetclover, but the clover portion of the mixtures did not differ significantly. There were no differences in total yield of forage among the fine mixtures.

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THE INFLUENCE OF INTENSITY AND FREQUENCY OF CLIPPING ON THE ROOT SYSTEM OF BROWNSEED PASPALUM

By E. S. Ruby and V. A. Young. Jour. Range Mangt. 6: 94-99. 1953.

Data obtained on the amount of roots of brownseed paspalum in the surface 12-inches of soil did not indicate that intensity or frequency of clipping during an 18-month period influenced the amount of roots in the surface soil. Decreasing the intensity was shown to compensate for increasing frequency of clipping in the surface soil. Frequency of clipping had a detrimental influence on the amount of roots in the second foot of soil. Grazing was not detrimental to the root systems of the plants where over-utilization was not apparent. The amount of roots in the claypan was twice as great as the amount of roots in the sandy soil just above the claypan. Frequency of clipping appeared to be detrimental to the amount of roots in the claypan soil fraction.

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BIRDSFOOT TREFOIL

By M. L. Peterson, L. G. Jones, and V. P. Osterli. Calif. Agr. Expt. Sta. Cir. 421. 1953.

Birdsfoot trefoil is a perennial legume that produces good quality irrigated pasture. Although it is grown throughout California, it is used most extensively on very heavy soils that are difficult to drain after irrigation. It seldom, if ever, causes bloat in cattle or sheep, even when grazed in pure stands. This circular describes the three types of trefoil in California and gives information on how to establish stands, grazing management practices, and pasture mixtures using trefoil.

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BERMUDA AS A PASTURE GRASS

By D. I. Dudley. Tex. Agr. Expt. Sta. Prog. Rpt. 1951. 1953.

Bermudagrass should be considered as a possible base pasture grass in much of the area east and south of the Denton station. Among several new selections are close-growing, short-leaved strains which are particularly adapted to making beautiful lawns. A soil building crop, such as sweetclover, should be planted for 1 or 2 years before sodding to Bermuda. A Bermudagrass pasture soon becomes sod-bound and thus responds to shallow cultivation every 3-5 years, annual fertilizer applications and a good legume as a companion crop.

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UTILIZATION OF GRASSLANDS IN THE FLINT HILLS OF KANSAS

By K. L. Anderson. Jour. Range Mangt. 6: 86-93. 1953.

As long as the present grazing system is continued, the Flint Hills can be expected to remain in good condition. It seems imperative that maintenance should be based on a sounder foundation than is now being used, however, and a knowledge of the ecological and physiological requirements of the forage grasses is therefore essential for every grassland manager.

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DIGESTIBILITY OF FORAGES, PIGMENTS INVOLVED IN THE CHROMOGEN(S) RATIO METHOD

By W. W. G. Smart, Jr., F. W. Sherwood, G. Matrone, and G. H. Wise. Jour. Agr. and Food Chem. 1: 318-321. 1953.

The purpose of this study was to determine the identities of the pigments involved and to obtain further evidence of validity of the chromogenic method. The pigments contained in the chromogen mixture used as an indicator of digestibility were isolated and identified.

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A PASTURE A DAY KEEPS LOSSES AWAY!

By M. L. Peterson and V. Osterli. Crops and Soils. 5 (7): 20-21. 1953.

A system of management called daily-rationed grazing is described. This method of management permits as many as 50 head of cattle grazing on a single acre of irrigated pasture at one time.

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MANAGEMENT OF RESEEDED RANGE AND ITS PLACE IN SUCH OPERATION

By H. B. Passey and D. S. Winn. Jour. Range Mangt. 6: 11-15. 1953.

Proper management of ranges leads to increased grazing capacity, increased length of grazing season, more and heavier lambs as well as other benefits.

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EFFECTS OF GRAZING INTENSITY UPON THE NUTRITIONAL VALUE OF RANGE FORAGE

By C. W. Cook, L. A. Stoddart, and L. E. Harris. Jour. Range Mangt. 6: 51-54. 1953.

Digestion studies were made during the grazing seasons of 1949-52 on typical saltbush ranges to evaluate the factors affecting the nutritional value of the foraging animals' diet. It was found that as the degree of utilization increased, the content of the more desirable nutrients in the available forage decreased, and, in addition, the digestibility of these nutrients was decidedly lowered.

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EFFECT OF CONTOUR DYKES AND FURROWS ON SHORT-GRASS PRAIRIE

By W. A. Hubbard and S. Smoliak. Jour. Range Mangt. 6: 55-62. 1953.

Most of the water available to the short-grass prairie is from spring rain. As the snow melts great quantities of water are freed. Dykes, contour furrows and dams were constructed to assist in the utilization of this water. After 13 years, clippings were made and vegetation analyzed to evaluate the benefit of the work. It was found that contour dykes were of real benefit in increasing the volume of forage produced. The contour furrows became filled with ice and snow during the winter and were of no value in holding or spreading water. All dykes should be seeded down soon after construction to prevent washing and erosion.

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FERTILIZING AND SEEDING FORAGE ON FOREST RANGE IN LOUISIANA

By F. A. Peevy. Agron. Jour. 45: 164-166. 1953.

Exploratory studies of fertilization, site preparation, and species were conducted on open longleaf pine forest range in central Louisiana from 1945 through 1948. Carpet grass and common lespedeza did best when seeded in mixtures of 5 and 15 pounds per acre, respectively. Only scattered stands of Dallis grass were established under the most intense treatments.

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GRASSLAND FARMING IS PLANNED PROSPERITY

By W. R. Thompson. Better Crops with Plant Food. 37(5): 17-20, 45-50. 1953.

Many farmers look upon money put into mowing machines, clippers, spraying machines, silage cutters, and haying equipment as a cost on their pasture program. They should look upon it as an investment. When farmers make a business out of growing grass, they naturally want to invest all the money in it that will make a good return.

They should study every way and place where more money invested will increase the return.

One of the most important parts of the pasture management program is refertilizing the pasture after it is put in. Oftentimes, farmers feel that by using the amount of fertilizer necessary to establish a pasture, it will be several years before any more fertilizer is needed. But it has been found that the best way to keep a good pasture good is an annual application of a balanced fertilizer.

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BERMUDA-GRASS

By W. C. Elder. Okla. Agr. Expt. Sta. and U.S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin. Forage Crops Leaf. 14. 1953.

Bermuda grass is a dependable pasture plant in eastern Oklahoma. It will stand abuse by overgrazing or improper maintenance and responds quickly to good treatment. With this grass the farmer can have an average pasture or a high-producing one, depending on the attention given to it. An outstanding feature of Bermuda-grass is the quick recovery after rains following the extended dry period during the summer and fall that can always be expected in any part of the state. Once it is established in a pasture, there is little chance of changing to other pasture grasses or using the land for cultivated crops.

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WEEPING LOVEGRASS

By J. R. Harlan, C. E. Denman, and W. C. Elder. Okla. Agr. Expt. Sta. and U.S. Dept. Agr., Bur. Plant Indus. Soils, and Agr. Engin. Forage Crops Leaf. 16. 1953.

In Africa where weeping lovegrass is native, it is considered as an intermediate plant in the succession from depleted farm and rangeland to good and excellent native ranges. It tends to invade depleted and abandoned farm land, burned and overgrazed pasture areas, but as it builds up the organic matter in the soil, gradually gives way to the better native grazing plants. Weeping lovegrass can be used in a similar way in Oklahoma by seeding it on poor, leached and eroded sites and eventually plowing it up to make way for better forage species. It also has an excellent place in small areas of intensive use, such as the trap close to farm buildings. It is drought-resistant, persistent and provides a good source of reserve roughage for emergency use and maintenance. The grass is not suggested for extensive range seeding, but it is very useful for special problem areas.

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USE OF WATER BY NATIVE VEGETATION VERSUS GRASSES AND FORBS ON WATERSHEDS

By F. J. Veihmeyer. Amer. Geophys. Union Trans. 34: 201-212. 1953.

Soil-moisture records from plots on potential range lands in California on which native vegetation, mostly woody brush species, was left intact, and from adjacent plots which were denuded by burning, were obtained for several years. Samplings, by which the amounts of soil moisture could be measured quantitatively, were taken with soil tubes at intervals frequent enough to give a satisfactory picture of the water regimen of the area. Twenty-three paired plots were used in the experiments. They were selected to give a wide variety of vegetative types, rainfall patterns, topography, and soils. At all the sites the rain generally fell from October through March, most of it in December, January, and February. The growth of the plants therefore was dependent to a large extent upon the amount of water that could be stored in the soil mantle. Following fire, grasses and forbs usually succeeded the brush, but several annual burnings were necessary before some species of brush were eliminated. The removal of the brush resulted in saving of moisture. The soil was at a higher moisture content in the burned plots than in the unburned at the end of the growing season; consequently, less water was required to refill the soil in the burned plots to its field capacity. In most cases, the results led to the conclusion that appreciable savings of water could be effected by burning the substitute grasses or forbs which have forage value. The records show that the soil in the burned areas was wet to its field capacity as early and, in many cases, earlier than in the unburned ones, thus indicating that the permeability of the soil for water was not adversely affected by burning.

COASTAL BERMUDA--A TRIPLE-THREAT GRASS ON THE CATTLEMAN'S TEAM

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By G. W. Burton. Better Crops with Plant Food 37(4): 6-10, 45. 1953.

Coastal Bermuda grass is a relatively new comer that is adapted to conditions from southeastern Oklahoma to the Atlantic and South to the Gulf. It is a triple-threat grass for the livestock farmer. It makes good grazing, is good for silage or hay. It also is excellent for drouth conditions. Planting and fertilizing methods are described.

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THE DESERT GRASSLAND, PAST AND PRESENT

By R. R. Humphrey. Jour. Range Mangt. 6: 159-164. 1953.

A study of historical and vegetational data points to the conclusion that the desert grassland of southwest United States and northern Mexico is not a true climax. Rather, it is a subclimax maintained by fire. Today, with fires largely a thing of the past, the true climax of low trees, brush, and cacti with an understory of grasses and low-growing shrubs is developing extensively on areas that were once grazed.

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TWO NEW FACTORS AFFECTING RESISTANCE OF GRASSES TO GRAZING

By F. A. Bronson. Jour. Range Mangt. 6: 165-171. 1953.

Two factors affecting resistance of grasses to grazing were studied for eight species of grass in the dissected loess plains of Central Nebraska. Heights of growing points and the ratio of fertility to vegetative stems were studied in switchgrass, western wheatgrass, buffalo grass, blue grama, and side-oats grama. In general, the grasses in which the growing points reached a height that permitted their removal by grazing decreased as intensity of utilization increased but grasses with growing points at the ground level usually increased. Also species with a high ratio of flower stalks to vegetative stems usually decreased in heavily grazed ranges.

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GERMINATION AND GROWTH OF BITTERWEED FROM SEED MATURED ON PLANTS KILLED WITH HERBICIDES

By O. E. Sperry and J. Morrow. Tex. Agr. Expt. Sta. Prog. Rpt. 1580. 1953.

The kill of bitterweed, Actinea odorata, on the range areas of Texas with herbicides applied with airplanes, buffalo turbines, and various adapted boom and nozzle spray equipment has been rather erratic over the past few years. Most failures have resulted when applications were made after the plants were mature and with concentrations of 2,4-D that were too low. Bitterweed is a drought-enduring plant, and treatment with herbicides while the plants are in an inactive physiological state, as during dry weather, has been ineffective. Experimental trials with hand sprays to screen various herbicides have, on the whole, been satisfactory, and the last trials run in Sterling County in 1951 gave highly satisfactory results with certain herbicides.

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Tree Fruits and Nuts

MOISTURE IN ORCHARD SOILS AS INFLUENCED BY AGE OF SOD AND CLEAN CULTIVATION

By A. L. Kenworthy. Mich. Agr. Expt. Sta. Quart. Bul. 35: 454-459. 1953.

Observations indicate that sod covers, when first established, may deplete soil moisture more than clean cultivation. However, as the sod culture and clean cultivation programs are continued, more soil moisture may be found under the sod than in clean-cultivated soil. This reversal of relationships apparently results from the gradual depletion of the soil and loss of structure. The sod cover still uses a considerable amount of soil moisture, but has maintained or improved the soil in regard to rainfall penetration and moisture-holding capacity. Clean cultivation, when first established, eliminates any depletion of soil moisture by crop growth. However, continued clean cultivation may reduce rainfall penetration, increase runoff and reduce moisture-holding capacity of the soil.

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CONSUMPTIVE USE OF WATER IN ORCHARD SOILS: II. EFFECT OF EVAPORATING POWER OF AIR AND OF LENGTH OF IRRIGATION INTERVAL

By J. C. Wilcox, J. L. Mason, and J. M. McDougall. Canad. Jour. Agr. Sci. 33: 231-245. 1953.

The rate of consumptive use of water was determined to a depth of 6 feet in the soil in 41 plots of mature McIntosh apple trees in 5 districts. Three locations were sampled in each plot, each being half-way between the trunk of the tree and the center of the tree square. Other consumptive use tests were made every few feet across the diagonals of tree squares. Records were also obtained in each district of the evaporation from an open water tank 12 ins. in diameter and 6 ins. deep. Considerable variation in rate of consumptive use was found to occur from point to point across the diagonal of a tree square. Great variability in rate of consumptive use was encountered among the three locations used in each tree square. A highly positive correlation was obtained between the rate of evaporation from an open water tank and the rate of consumptive use. A significant negative correlation was obtained between the length of irrigation interval and the average daily rate of consumptive use.

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PECAN VARIETY PERFORMANCE BEFORE AND AFTER ORCHARD WAS GRAZED

By J. H. Hunter. Better Crops with Plant Food 7 (6): 17-20, 39-40. 1953.

The comparative results from a block of pecan trees of three varieties for two periods which involve changes in cultural practices are reported. In the first period, winter cover crops were grown and returned to the soil, and the land was cultivated during the summer. In the second period, grazing crops were grown and no summer cultivation was practiced.

Tree growth of all three varieties as measured by increase in the cross-sectional area of the trunks was less when summer cultivation was practiced than when grazing was practiced. The yields of two of the varieties were considerably less when summer cultivation was practiced than when grazing was practiced, and the production of nuts per cross-section area increase was greater when grazing practices were followed. The nuts produced by these two varieties were smaller during the years when grazing was practiced but kernel development was equal if not superior to that when summer cultivation was practiced.

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CONTROL OF WINTER ANNUAL WEEDS WITH 3-CIPC IN A STOOLBLOCK OF MALLING APPLE ROOTSTOCK

By R. F. Carlson and H. B. Tukey. Mich. Agr. Expt. Sta. Quart. Bul., 35: 450-453. 1953.

The results reported in this paper deal with applications of isopropyl N-(3-chlorophenyl) carbamate (referred to hereafter as "3-CIPC") for the control of winter annual weeds in a stoolblock of Malling apple rootstocks. The use of 3-CIPC at 6 pounds per acre, applied when the rootstock is dormant, appears to be satisfactory for control of many of the winter annual weeds in stoolblocks of Malling apple rootstocks. Although the results reported in this test deal only with fall applications, it is suggested that early spring applications may also be effective at a time when weeds are becoming active and rootstocks are still dormant.

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CONSUMPTIVE USE OF WATER IN ORCHARD SOILS: I EFFECTS OF SOIL DEPTH

By J. C. Wilcox and J. L. Mason. Canad. Jour. Agr. Sci. 33: 101-115. 1953.

The effect of depth in the soil on the rate of consumptive use of water has a direct bearing on the depth of irrigation required. In this investigation, consumptive use was greatest in the top foot, and declined successively with each foot increase in depth. In some cases it dropped to zero before reaching 6 feet. In most cases, there was still some consumptive use at 6 feet, though usually it was of little practical importance below 4 feet. This meant that below 4 feet the soil was almost always quite moist at time of irrigation. It appears from this that where a regular supply of irrigation water is available, it should be sufficient to irrigate a mature orchard to a depth of four feet.

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FURTHER OBSERVATIONS AND INVESTIGATIONS ON MANGANESE DEFICIENCY IN FRUIT TREES IN BRITISH COLUMBIA

By C. G. Woodbridge and H. R. McLarty. Canad. Jour. Agr. Sci. 33: 153-158. 1953.

A manganese deficiency has been found in many species of plants in the southern interior of British Columbia. In most instances, the deficiency is slight and the symptoms are somewhat similar. In a few areas, marked deficiency symptoms have been found, characterized by poor leaf development and necrosis of some tissues. The results of chemical analysis indicated a good correlation between the presence of manganese deficiency symptoms and manganese content of affected tissues.

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Vegetable Crops

FLAVOR AND SOIL TREATMENT: FLAVOR OF SELECTED VEGETABLES GROWN IN SOIL TREATED WITH ISOMERS OF BENZENE HEXACHLORIDE

By E. H. Dawson, G. L. Gilpin, M. E. Kirkpatrick, and C. A. Weigel. Jour. Agr. and Food Chem. 1: 399-403. 1953.

Studies were made to determine the effect on flavor of tomatoes, lima beans, potatoes, radishes, and carrots from use of purified gamma, alpha, beta, and delta isomers of benzene hexachloride, a mixture of these isomers, commercial gamma isomer, and lindane as insecticides in growing the vegetables. The results indicate that flavor may be affected by certain formulations of benzene hexachloride; the effect on flavor varies with the formulation, the dosage rate, and the type of vegetable grown.

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THE EFFECT OF VARIOUS CANNING CROP ROTATIONS ON CERTAIN SOIL CONSTITUENTS OVER A FIVE-YEAR PERIOD

By H. Hill, R. F. Bishop, and H. B. Cannon. Canad. Jour. Agr. Sci. 33: 210-215. 1953.

Changes that have occurred in certain soil constituents during the initial 5-year period in nine different rotations with canning peas, tomatoes, and corn are discussed.

In a 2-year rotation of peas and tomatoes or peas and corn, where in addition to commercial fertilizer 12 tons of manure were applied every second year and 2 green manure crops were grown after harvesting the peas, an increase occurred in soil organic matter, exchangeable potassium and easily acid soluble plus adsorbed phosphorus. Results from another rotation where the corn stover was returned to the soil indicate this practice to be helpful in maintaining soil organic matter. The highest yields of corn, peas, and tomatoes occurred where manure was used and the highest average yields were obtained in 2-year rotations with uninterrupted production of canning crops. Reduced yields of peas and corn occurred when clover was seeded with these crops. Soil test values as well as the calculated additions and removals of phosphorus and potassium suggest that larger amounts of phosphorus and smaller amounts of potassium were used than necessary for the particular areas.

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PLANT NUTRIENTS--FOLIAR APPLICATIONS TO VEGETABLE CROPS

By R. L. Isaacs, Jr. and J. B. Hester. Jour. Agr. and Food Chem. 1: 239-240. 1953.

Urea spray with a suitable wetting agent applied to the foliage in the regular spray program for control of insects and disease has proved very effective in supplying nitrogen to certain vegetable crops. Urea and ammonium nitrate in equal mixture can be used for certain vegetable crops at a greater concentration than either material alone.

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SOME ASPECTS OF FERTILIZER USE FOR POTATO PRODUCTION AND TUBER QUALITY

By H. Hill. Better Crops with Plant Food. 37 (4): 11-16, 46-50. 1953.

There are indications that yield will be reduced if the phosphorus in the petiole tissue is below 50 ppm. A reduction in yield is associated with levels of potassium below 5,000 ppm. If muriate of potash is employed as a source of potassium there is a marked absorption of chlorine by the plant. There is no apparent relationship between a reduction of dry matter in the tuber and the chlorine content. While an application of 100 pounds of K_2O per acre in the form of muriate of potash reduced the dry matter only a fraction of one percent, an application of 300 pounds of K_2O reduced the dry matter over 2%.

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REDUCED ASCORBIC ACID CONTENT OF POTATOES GROWN WITH AND WITHOUT STRAW MULCHING AND IRRIGATION IN EASTERN NEBRASKA

By H. O. Werner, R. M. Leverton, and M. R. Gram. Nebr. Agr. Expt. Sta. Res. Bul. 170. 1951.

This bulletin reports the results of experiments conducted to determine whether straw mulching or irrigation is intrinsically capable of altering the ascorbic acid content of tubers; whether ascorbic acid will be retained better by harvesting potatoes before or at maturity and holding them in storage, or by allowing them to remain in the field until there is danger of freezing; and whether differences in ascorbic acid content of tubers will persist during storage. It was found that irrigation and straw mulching prolonged the life of the plants and increased the yield of tubers, but in two of the three years tested, because of high rainfall, these increases were not as great as in most Nebraska seasons. Straw-mulched potatoes had significantly higher ascorbic acid values following the period of maximum growth. Straw-mulched tubers had higher ascorbic acid values throughout the storage period than cultivated tubers.

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CHEMICAL CONTROL OF WEEDS IN PEAS

By J. S. Leefe. Sci. Agr., 32: 581-585. 1952.

Both pre-emergence and post-emergence treatments with herbicides controlled wild radish in peas.

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PRE-EMERGENCE TREATMENTS FOR WEED CONTROL IN CANTALOUPES

By H. W. Gausman, N. Cain, and W. R. Cowley. Texas Agr. Expt. Sta. Prog. Rpt. 1585. 1953.

Alanap-1 at 4 pounds per acre was the most satisfactory pre-emergence formulation. The population of careless weeds was reduced 67.3% and that of bur-grasses 71.2%. With the presence of a severe nematode infestation, Alanap-1 gave the lowest reduction in stand of cantaloupes, amounting to 21%.

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EXUDATION PRESSURE IN ROOTS OF TOMATO PLANTS UNDER HUMID CONDITIONS

By E. L. Breazeale and W. T. McGeorge. Soil Sci. 75: 293-298. 1953.

These experiments present further evidence that intake of water may be a major function of the leaves under conditions of high humidity.

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Pest Control--General

PRELIMINARY INVESTIGATIONS IN CHEMICAL CONTROL OF THE PALE WESTERN CUTWORM

By L. A. Jacobson, H. McDonald, I. S. Lindsay and P. E. Blakeley. Sci. Agr., 32: 592-596. 1952.

Chlordane, dieldrin, and toxaphene applied as sprays to the soil were the most effective of the chemicals tested in controlling the insect.

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INDUCING DISEASE RESISTANCE WITH PLANT GROWTH-REGULATORS

By D. Davis and A. E. Dimond. Phytopathology. 43: 137-140. 1953.

The chemotherapeutic activity of various plant growth-regulators was investigated. Four of those studied reduced the Fusarium wilt disease of tomato. The chemotherapeutically active plant growth-regulators were relatively poor fungi-toxicants *in vitro*. They induced changes in the metabolism of the host. Symptomatic of a modified metabolism were (a) formative effects, (b) reduced plant weight, and (c) decrease in the reducing sugar content of the host tissues. The chemotherapeutic activity of plant growth-regulators was directly related to the interval between inoculation and treatment, becoming more pronounced the longer the time that inoculation followed treatment.

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HERBICIDES--CHEMICAL WEED CONTROL

By C. E. Minarik and A. G. Norman. Jour. Agr. and Food Chem., 1: 42-44. 1953.

Chemical weed control in a diversity of forms has developed greatly during the past few years. Further technological advances may well depend on an extension of fundamental research on growth processes in plants. Much can be done to improve retention of herbicidal sprays by plants, to aid entry into particular species, and to understand their subsequent transport and action in the plant. Plant herbicides have been selected for high potency and broad toxicity. When selective weed control is practiced it may be possible to incorporate a lower level of responsiveness to the herbicide in order to make the control of dominant weed species more effective. For pre-emergence applications to prevent germination of weed seeds or establishment of weed seedlings, compounds only slowly utilized by the soil population may be required.

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HERBICIDE APPLICATION--SOME CONSIDERATIONS IN CHOOSING METHODS

By K. C. Barrons. Jour. Agr. and Food Chem., 1: 45-47. 1953.

A number of theoretical considerations must be taken into account in choosing a herbicide application method. Mode of entry of herbicide into the plant, nature and extent of translocation with the plant, nature of plant responses to the herbicide, variations in species and varietal response, effects of stage of growth and the physiological condition of plant, effects of atmospheric environment, relative persistence of the herbicide in soil, effects of soil environment on availability, leaching, and absorption, possible contamination effects adjacent to treated areas, toxicological considerations, and physical properties of the compound are discussed with respect to several well known herbicides.

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BRUSH CONTROL--STATUS OF CHEMICAL METHODS

By R. H. Beatty. Jour. Agr. and Food Chem. 1: 179-181. 1953.

The status of chemical brush control is reviewed. Foliage and basal spraying, stump treatment, and drilling with ammonium sulfamate, 2,4-di, and 2, 4,5-trichlorophenoxyacetic acids or derivatives are discussed. Emphasis is placed on a few weaknesses, the aspect most important to future progress. The two most urgent research problems are the effect of the phenoxy compounds or their breakdown products on the dormant buds in the root stem transition zone and their poor movement into the lateral rhizomes.

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WEED CONTROL--PRE-EMERGENCE METHODS

By D. E. Wolf. Jour. Agr. and Food Chem. 1: 181-183. 1953.

Pre-emergence weed control refers to the application of the chemical to the soil after the crop has been planted but before it emerges. Although this weed control practice is still in an early stage of development, several chemicals have given outstanding results. Most favorable results have been reported in this type of treatment from 2, 4-D, calcium cyanamide, CMU, 2-secbutyl-4,6-dinitrophenol, sodium, 2,4-dichlorophenoxyethyl sulfate, TCA and chloro IPC. The factors affecting the results of pre-emergence treatments are: The type of weeds present, moisture content of the soil, rainfall, soil pH, soil type, organic matter content, soil temperature, and type of crop.

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CHEMICAL CONTROL OF HUISACHE

By R. A. Darrow, L. Reyes, and R. A. Hall. Tex. Agr. Expt. Sta. Prog. Rpt. 1560. 1953.

Effective control of huisache can be obtained throughout the year with oil applied at the trunk base in sufficient quantity to thoroughly cover the root crown. Effective sprout control can be obtained by application of sprays containing 8 pounds of 2,4,5-T as an ester in 100 gallons of oil on freshly cut stumps.

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RESPONSE OF LINDHEIMER PRICKLYPEAR TO 2,4,5-T AND OTHER HERBICIDES

By R. A. Darrow, L. Reyes, and R. A. Hall. Tex. Agr. Expt. Sta. Prog. Rpt. 1561. 1953.

Effective control of mature plants and sprout regrowth of Lindheimer pricklypear was obtained with 2,4,5-T ester at 0.6 and 1.0% acid in oil and 1:1 oil-water sprays.

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CHEMICAL CHARACTERISTICS OF PHOSPHORUS COMPOUNDS TO KILL APHID AND SPIDER MITES BY SYSTEMIC ACTION

By E. E. Ivy. Agr. Chem. 8: 47-50,137-139. 1953.

This paper discusses the chemical characteristics of phosphorus compounds that kill aphids and spider mites by systemic action. Two types of systemic action were found to occur in the phosphorus compounds studied. In one type, characterized by compounds related to para-oxon, the translocation was local and was possibly purely mechanical. In the second type, the insecticide applied to any part of the plant was translocated to all parts of the plant, and treated plants may remain toxic to insects for several months.

Compounds exhibiting the second type of systemic action were acid anhydrides of substituted phosphoric acids having potential sites of enzymatic action as a part of the anhydride linkage.

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2,4-D--MECHANISMS OF ACTION

By R. L. Weintraub. Jour. Agr. and Food Chem., 1: 250-254. 1953.

Although there exists a considerable body of observations relating to the morphological, physiological, and biochemical effects of 2,4-D on plants, it has not been possible to integrate this information into a unified picture of mechanism of action. The present paper summarizes a portion of this knowledge and discusses the relationship between activity and chemical structure of related growth regulators, of the interactions between 2,4-D and endogenous growth regulators, and of in vito transformations of 2,4-D which may be expected to contribute to final solution of the problem.

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COMMERCIAL HERBICIDES--PRESENT METHODS OF FORMULATION

By J. A. Kelly. Jour. Agr. and Food Chem., 1: 254-257. 1953.

Herbicides in wide use today include 2,4-dichlorophenoxyacetic acid (2,4-D) 2,4,5--trichlorophenoxyacetic acid (2,4,5-T), 4-chloro-o-toloxyacetic acid (MCP), dinitro-o-secbutylphenol (DNOSBP) and pentachlorophenol. This paper discusses some of the methods used to formulate these chemicals into usable commercial products as well as problems relating to the choice of amines as solubilizers for 2,4-D and 2,4,5-T formulations.

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THE EFFECTS OF FUNGICIDES, INSECTICIDES, HERBICIDES AND FERTILIZER SALTS ON RESPIRATION OF ROOT TIPS OF TREE SEEDLINGS

By G. K. Voight. Soil Sci. Soc. Amer. Proc. 17: 150-152. 1953.

The effect of various eradicants and fertilizers used in nursery practice on the oxygen uptake of excised root tips of seedlings of jack pine, red pine, white pine, and black locust seedlings was investigated, using manometric techniques. The compounds studied included calomel, spergon, thiosan, chlordane, Stoddard oil, and common fertilizer salts applied at ordinary rates. The measurements show that some of the compounds applied to nursery soils are inhibitory to the metabolism of roots of young seedlings. The results also indicate that manometric methods of analysis provide a useful tool for the evaluation of the effect of various chemical compounds used in current nursery practice.

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HERBICIDES--THEIR ABSORPTION AND TRANSLOCATION

By A. S. Crafts. Jour. Agr. and Food Chem. 1: 51-55. 1953.

Autographs of bean plants treated with radioactive 2,4-D prove that absorption is rapid, the chemical migrates to the vascular tissues, and translocates at rates up to 100 cm. per hour through the stem and into the roots. Radioactivity decreases in time in the roots and treated leaf; it accumulates up to 72 hours in hypocotyl, epicotyl, and terminal bud. An adequate water supply is required for bending of the epicotyl from 2,4-D but not for translocation through the vascular system. When radio-2,4-D is applied to spots on the bean leaf, much more 2,4-D is absorbed and translocated from spots over the midrib than from spots on the edge or tip of the leaf.

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FORESTRY, WOODLOTS, SHELTERBELTS

THE EFFECT OF SEASONAL AND CULTURAL VARIATIONS ON MATURITY OF WOODY PLANTS COMMONLY GROWN ON THE CANADIAN PRAIRIE

By J. Wilner. Sci. Agr., 32: 568-573. 1952.

Studies were conducted to determine the relative effects of seasonal variations and several cultural treatments on the water content of mature twigs of 19 plants commonly grown in the Canadian prairies for windbreak purposes and fruit production. It was concluded that the water content of mature twigs of woody plants is an inherent trait that cannot be easily modified by cultural treatments or seasonal variations. Selection of plants with relatively lower water content is desirable.

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WIND TUNNEL STUDIES OF SHELTERBELT MODELS

By N. P. Woodruff and A. W. Zingg. Jour. Forestry. 51: 173-178. 1953.

This is a report of a study initiated with two purposes in mind: (1) to obtain quantitative measurements of the protective effects of the number of rows of trees and shrubs within a shelterbelt, and (2) to obtain information on their design and orientation with respect to wind direction. Models of a 5-row, 7-row and two different designs and two orientations of a 10-row shelterbelt were used in a wind tunnel to obtain this information.

The different shelterbelts are ranked according to their effectiveness in reducing the velocity at the ground surface and at elevations above the surface. A 10-row shelterbelt of conventional design was found to be the most effective at both levels. The alternate designs of 10-row belts were less effective or were variable in their effectiveness, with some designs showing relatively more effectiveness at higher elevations than at the surface. The 5- and 7-row shelterbelts were found to offer nearly as much protection as the 10-row design.

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PROCEDURES FOR ANALYZING SMALL WOODLANDS

By L. O. Grapp. Jour. Forestry. 51: 269-274. 1953.

Management plans for woodland require the same basis of technical information as do longer range and more elaborate plans for larger holdings. The time required to secure this information must, however, be in proportion to the size, present and future value of the woodland. The development of the procedure described in this article has contributed greatly to the work of foresters concerned with small woodlands.

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FOREST RANGING BEEF

By W. O. Shepard. N. C. Agr. Expt. Sta. Res. and Farming, 10 (4): 11. 1953.

Research is showing that deep down in eastern Carolina's flat land is a valuable cattle feed. Cows can be maintained on cane or "reed" forage all year round in the coastal areas of the state and cattle raising can be combined with good timber management. But the tests are also showing that it may be advisable to use supplemental pastures or feed during the winter months.

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PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE MAJOR TYPES OF FOREST HUMUS FOUND IN THE UNITED STATES AND CANADA

By D. L. Mader. Soil Sci. Soc. Amer. Proc. 17: 155-158. 1953.

In order to broaden the existing classification of forest humus, a systematic analytical study was undertaken as a cooperative project including specialists from forestry and agricultural colleges, U. S. forest experiment stations, and private forestry enterprises. Classification of humus samples was made in accordance with suggestions of collaborators or on the basis of proposals made in the course of the last five years. Results of analysis suggest that humus layers of different morphological makeup maintain certain distinguishing physical and chemical characteristics over an enormously wide territory.

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PROPER CARE INCREASES VALUE OF FARM WOODLAND

By F. M. Meade. Ark. Agr. Expt. Sta. Farm Res. 2 (2): 3. 1953.

A woodland in the Coastal Plains area, if properly cared for, will increase the farm income substantially. This is shown by a woodland in Hempstead County, which after 14 years of management is now producing $15.00 per acre annually in stumpage value.

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BIOLOGY

CONSUMPTION OF NATIVE FORAGE SPECIES BY CAPTIVE MULE DEER DURING SUMMER

By A. D. Smith. Jour. Range Mangt. 6: 30-37. 1953.

Forage preference studies were conducted with captive mule deer. They consumed a greater amount of herbaceous material than browse until late in May. Thereafter, browse became more important in the diet, until at the end of the season less than 10% of the daily consumption was of herbs.

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PARTIAL POISONING OF OVERCROWDED FISH POPULATIONS

By H. W. Swingle, E. E. Prather, and J. M. Lawrence. Ala. Agr. Expt. Sta. Cir. 113. 1953.

Experiments begun in 1948 have resulted in the development of a method of correcting overcrowded pond fish populations by partial poisoning with rotenone and are reported in this circular.

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THE FERTILIZATION AND CULTURE OF ROSA MULTIFLORA IN NORTHERN INDIANA

By K. D. Doak. Better Crops with Plant Food. 37(4): II 19-24, 44. 1953.

The growth response of Rosa multiflora appeared to be very closely related to nitrogen balance in comparison with phosphorus and potassium.

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